

Implementing an Elementary Standards-based Curriculum

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Everyday Mathematics and other reform-minded curricula may be implemented successfully in school districts with several key components in place. These curricula, rich in conceptual understanding of mathematics, offer opportunities for increased learning and improved student attitudes about mathematics. Teachers and parents likewise are affected in positive ways.

The School City of East Chicago (SCEC), along with eight other school districts from across Indiana, joined the Indiana Mathematics Initiative (IMI), a Math and Science Partnership funded by the National Science Foundation (NSF) in 2002. One of the goals of the elementary component of the project was to develop a leadership cadre of teachers, who would, in turn, provide leadership and professional development for their own districts. In order to bring cohesiveness to the professional development, focused on deepening teacher content knowledge and pedagogical knowledge on the use of reform-minded practices in mathematics classrooms, it was decided that all the districts would participate in piloting the same elementary, NSF-funded curriculum. *Everyday Mathematics* was the program that was chosen at the elementary level.

In 2004, SCEC was one of the eight participating districts that adopted *Everyday Mathematics* for use throughout the district. A systemic approach in implementing such curricula is an evolutionary one requiring buy-in from all stakeholders. It is a gradual process based on continuous support throughout various stages of development. There are moments of concern and moments of celebration when goals and accomplishments are met. Improved teacher competence, professional fulfillment, and increased student achievement are promising results.

This paper details the journey of the School City of East Chicago as teachers piloted the *Everyday Mathematics* curriculum and after the program was adopted for use in all the district elementary schools. Several components worked together to help the implementation of the program throughout the district.

Initial Piloting of the *Everyday Mathematics* Program

Initial steps of the implementation process involved researching and understanding the basic principles and philosophy behind the reform-minded *Everyday Mathematics* curriculum. This program was developed by University of Chicago Mathematics Project, with funding from the National Science Foundation. *Everyday Mathematics* was designed to strengthen mathematics instruction in American schools, making math education strong and comparable to that of other countries, including Japan and the European nations.

Everyday Mathematics places an emphasis on higher order thinking skills and builds on the ideas that children are curious and start school with a great deal of knowledge and intuition. Children learn to construct their own meaning through engaged instructional activities beginning with pre-kindergarten and continuing through sixth grade. Mathematics instruction includes more than just arithmetic. It also incorporates geometry, data analysis, measurement, probability, and algebra. Problem solving is embedded throughout the program. Included are rich problems,

mathematical modeling, and cross-curricular connections. The curriculum is balanced with concepts, skills, facts, and tools.

A wide variety of student learning styles is addressed through the use of various computational methods, including the use of a variety of computational algorithms and mental strategies. Classroom instructional methods regularly incorporate cooperative learning and small group activities. Students learn by doing and investigating. Activities that call for exploration of patterns and extensions of mathematical concepts, along with strategies for differentiating instruction, provide challenging and motivating activities for a broad range of students, including those who are highly-able, as well as students with special needs. Materials in Spanish are also provided for Spanish-speaking students and their families, as needed.

The research on this standards-based curriculum shows that its use leads to improved student achievement. (See, for example, *The Tri-State Student Achievement Study Executive Summary* from the ARC Center, 2003, at http://everydaymath.uchicago.edu/about/tristate_student_achievement_study.pdf or the report on *EM* from the United States Department of Education's What Works Clearinghouse, found at http://ies.ed.gov/ncee/wwc/pdf/WWC_Everyday_Math_043007.pdf) There is more geometry, measurement, algebra, problem solving, reasoning, and communication here than is provided by more traditional elementary curricula.

SCEC had participated in a previous IMI NSF grant for middle school mathematics and had adopted the standards-based middle school curriculum, *Connected Mathematics Project* (CMP). Because of this experience, elementary teachers in the upper grades had been introduced to CMP and its strong emphasis in inquiry-based, hands-on mathematics with ongoing professional development. As a consequence, there were teachers in the elementary grades who were more than willing to participate in the IMI project at their level.

IMI provided opportunities for teachers to pilot *Everyday Mathematics* and go through ongoing lead teacher training. An initial cohort of teachers in second and fifth grades piloted the program in the first year of the project. These teachers became mentors to a second cohort of third and fourth grade teachers, who joined the project in its second year. In year three, the district adopted *Everyday Mathematics* for all elementary classrooms. Thus, these first two cohorts of experienced teachers were able to act as mentors not only to the third cohort of kindergarten and first grade teachers, who began participating in year three, but also to other teachers in the district using *Everyday Mathematics* for the first time.

The NSF grant also provided professional development sessions for the participating teachers, led by IMI staff and *Everyday Mathematics* consultants. The program's components and student materials were thoroughly explored. Intense summer training sessions and follow-up support group sessions were held. These allowed teachers to analyze articulation and concept development for math strands across all grade levels, and review and discuss current professional math issues through research-based literature in the field of math education. In addition, participating teachers completed monthly online reflections, which were read and responded to by experienced *Everyday Mathematics* consultants.

These participating pilot teachers began sharing successes with other teachers in the district. Equipped with their growing knowledge about the curriculum and the positive experiences in their classrooms, they began to encourage fellow staff members to explore and consider adopting *Everyday Mathematics* for the next six-year text adoption cycle. Children strongly voiced their support as well. Teams of pilot teachers along with student envoys and an IMI staff member gave testimonials at each elementary school during building staff meetings. Question and answer periods were built in to the schedule to address teacher needs. This was a critical piece in convincing teachers that *Everyday Mathematics* had many benefits.

A presentation by the district coordinator in charge of coordinating the IMI project activities, select pilot teachers, and principals was made before the school board. *Everyday Mathematics* materials were described and displayed at the meeting, followed by a question and answer period. Convincing evidence was presented which showed that children in pilot classes outperformed students in non-*Everyday Mathematics* pilot classrooms on the mandated state tests. This applied in almost all cases throughout the school district. Data persuaded teachers to take a hard look at *Everyday Mathematics*. The school board was impressed.

Once adopted, *Everyday Mathematics* materials were ordered including teacher resource packages, student reference books, student journals, home links, study links, assessment CD's, and class manipulative kits. A two-day summer in-service session was held on a voluntary basis, of which some teachers took advantage. Additional training was offered to teachers throughout fall semester. In addition, specific staff development was offered half and full days. Calculators for the primary grades and dry erase markers (for students to use with small whiteboards) were purchased and distributed throughout the year. Special education had unique needs due to multi-grade teaching arrangements; materials were ordered for those classrooms based on their individual needs.

Implementing *Everyday Mathematics* throughout the District: The First Year

Staff development programs for the first year of implementation addressed various levels of staff needs. It included a k-6 teacher component, an introductory segment for middle and high school teachers, and an administrative awareness piece. Programs to educate and involve parents were also included.

Elementary Teacher Component

The elementary professional development was differentiated in order to meet the widespread needs of teachers with varying backgrounds and experiences with the *Everyday Mathematics* materials. There were three levels of professional development training including sessions for teachers who were now experienced in using the curriculum, teachers who had just completed piloting the curriculum, and teachers brand new to using *Everyday Mathematics*.

Another essential component of the successful implementation of the curriculum was the support provided by the IMI project and its network of teachers and professionals. The opportunities to receive and provide support to and from teachers in other districts were invaluable. The strong teacher leadership training component of the project was also greatly needed. The teachers could receive training and support from the IMI project, and then, in turn, provide similar training and support for other teachers in the district.

A fall staff development day and several half-day sessions were set aside for ongoing staff development. Most presentations were facilitated by the IMI Select Cadre teacher leaders. However, kindergarten and first grade teachers attended sessions provided by McGraw-Hill-trained facilitators, since they had not yet had any previous opportunity to participate in the IMI leadership training. In addition, a spring elementary department meeting was held after school. A panel of cadre teachers for grades three through six shared pacing schedules and assessment ideas with colleagues in the auditorium. The question and answer periods at the end of the sessions gave participating teachers an opportunity to address personal concerns. Survey results showed satisfaction with the staff development delivery approach. Teachers appreciated the opportunity to ask questions and learn about each other's progress and concerns across various grade levels. They agreed to focus on accelerating their pacing and staying on schedule during the following school year. They appreciated new assessment ideas.

Special Education teachers' needs were met through training from Caddie Miller, a renowned national presenter on *Everyday Mathematics* and differentiation for special needs students. A mentorship program was established to assist teachers with need of support and new teachers. There was a new teacher training built in early to the staff development plan. It ranged from breakout sessions at regular staff development days to yearly personalized sessions throughout the year after school scheduled in individual buildings for new teachers and those in need of review at each grade level. These were tailored to meet individual teacher needs.

There were several additional topics for professional development. Math content in-service sessions were held periodically to provide review of content in areas such as algebraic concepts, geometry, alternative algorithms, measurement, and others. Often these offerings were two-hour sessions held after school. Another key topic included training on the use of the assessment CD that comes with the curriculum materials. Teachers learned how to perform end-of-unit assessments that indicate student mastery of the curriculum goals aligned with the Indiana academic standards. These assessments were also used as formative tools to evaluate student progress throughout the district. Additionally, teachers began a curriculum mapping process which aligned *Everyday Mathematics* instructional resources to math content, the Indiana Academic Mathematics Standards, and skills development. Along with curriculum mapping, the articulation of mathematics concepts and topics within a grade level and across the grade levels was addressed.

Middle and High School Teacher Component

Concurrently, junior and senior high school teachers were introduced to *Everyday Mathematics* lessons and principles. They learned about the alternative computational algorithms in the program and how the mathematics concepts naturally progress into seventh- and eighth-grade classrooms. They noted connections between *Everyday Mathematics* and *MathThematics*, the NSF inquiry-based mathematics curricula for middle school adopted by the district. High school teachers who had previously participated in IMI summer workshops on using mathematical modeling in their classrooms were more receptive to the elementary and middle school standards-based programs than those not exposed to math modeling instructional techniques.

Administrative Awareness Component

Another very important aspect of successful implementation of the curriculum was an administrative awareness professional development component initially provided by the IMI project and later continued by the local district with local trainers. These sessions were well attended by building administrators at all levels as well as administrative staff members from the central office. Participants were introduced to *Everyday Mathematics* ideas and sampled various *Everyday Mathematics* lessons. They learned what administrators should look for in classrooms and how special education needs were addressed. They also learned how to support teachers in their buildings and help them succeed with *Everyday Mathematics*.

Gaining Parental Support

Parent family nights were also added throughout the first two years of implementing *Everyday Mathematics* to educate parents about the new *Everyday Mathematics* curriculum and bring them on board with their children's challenge of learning these new materials.

Parents are essential stake holders in their children's education. For parents to know how *Everyday Mathematics* operates was paramount to obtaining necessary parental support and vital to the success of the program in SCEC. Family nights were held throughout our district at each elementary school. The select cadre lead teachers scheduled at least two programs involving both

primary and intermediate grades yearly. A local Twin City East Chicago Education Foundation grant was obtained with money allocated to purchase family games for all schools to use at family nights with parents and children. Games ranged from those played with fraction/decimal/percent card decks to ones played with spinners and money/time card decks. Family nights were well attended, and survey forms indicated parents were pleased to be involved with their children's education. They appreciated having their children teach them *Everyday Mathematics* games and asked for more parent night opportunities. An additional science/math parent night was held to highlight both subject areas during one evening at one of the elementary schools. Two parent university sessions were held at the high school for elementary, middle, and high school parents and their children and were well attended during both fall and spring semesters. These sessions continued to flourish on a regular basis.

Maintaining Implementation of the Curriculum beyond the First Year

After the initial year, the success of the *Everyday Mathematics* program in the district was dependent on continued professional development for teachers and support from administration. IMI continued to lead the way with ongoing professional development and continued leadership training for the select cadre teachers during summer and school year sessions. The textbook publisher also offered continued training opportunities for interested teachers. This ongoing support in turn allowed teachers to continue building their *Everyday Mathematics* knowledge and skills. Mentoring by the select cadre teacher leaders and peer observation opportunities were readily available for colleagues to learn from each other at their buildings; they were able to discuss children's work as well as strategies for continued improvement. Math content review opportunities were offered regularly, with the common goal of improving elementary teachers' mathematics knowledge and teaching skills.

Local district professional development continued to be provided as well for new teachers, substitute teachers, and instructional aides, along with new pre-school staff. Materials developed by the IMI Select Cadre teachers were used for training purposes. These included assessment ideas and handbooks for new teachers and for substitute teachers. Team teaching was strongly encouraged at upper elementary grades where more specialization was needed; teachers with a strong understanding of mathematical concepts could then be the math teachers for their grade levels.

Continued involvement in math modeling sessions at the secondary level was promoted to foster natural progression of inquiry-based math explorations at higher grade levels. Continued middle school liaison ongoing training helped provide continued articulation and consistency between the elementary and middle schools.

In addition, a partnership was established with the education department of a neighboring college, Calumet College of St. Joseph. Local school district trainers presented *Everyday Mathematics* methodologies to the Education Committee and made guest presentations in pre-service elementary mathematics methods classes. Several elementary and middle school education graduates were later employed in the school district.

Challenges

There were many challenges in implementing *Everyday Mathematics*. Initially, recruitment of teacher volunteers to pilot the reform materials, as well as finding time for the local district coordinator to facilitate the implementation process and the professional development activities, became monumental tasks. Also, keeping open communication lines with all parties was vital.

This involved emails, phone calls, personal visits and working closely with administrators, teacher union representatives, and other stakeholders.

Teachers with varied levels of experience using the curriculum meant that the district's professional development needed to be differentiated based on the teachers' needs. Additionally, each year there are teachers new to the district and to *Everyday Mathematics*; they require training on curriculum implementation. Following *Everyday Mathematics* pacing schedules also became indispensable, and transitioning new students from districts with traditional math settings was initially challenging.

There were smaller challenges as well. Ordering *Everyday Mathematics* replacement materials early enough in the spring to ensure that essential student workbooks and journals were in place during the first day of school was of great importance. Likewise, orders need to be placed for special education as well as Spanish materials for students with limited English proficiency in a timely manner.

Conclusion

Monitoring regular and appropriate use of the NSF-funded curriculum and persuading teachers to trust its spiral effect became critical to success, as was making sure that all essential components of the program were in place and being implemented properly. Accessing data to drive instruction and making adjustments to the program when necessary were part of the evaluation process, which resulted in improved student learning and teacher performance.

As mentioned earlier, ongoing staff development at all levels with support for all parties involved were top priorities. It is apparent that a training of trainers model worked well with *Everyday Mathematics* in the School City of East Chicago.

Continued success with *Everyday Mathematics* is based on providing students with multiple opportunities to learn concepts and practice skills. Administrators and teachers need continued and ongoing professional development and support. As the next textbook adoption cycle approaches, district teacher leaders will reconvene to discuss current and future needs for teachers. District administrators must also rise to the occasion and continue supporting teachers with *Everyday Mathematics* best practices in classrooms. Data collection to look for improvement in student learning along with favorable attitudes toward mathematics at all levels must be sustained. Continued collaboration and cohesive team efforts while nurturing, monitoring, evaluating, and modifying must all take place in order to again ensure successful results.

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