Using the Kumon Method to Revitalize Mathematics in an Inner-Urban School District

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Abstract

It is a compelling challenge to provide inner-urban K-12 students with the skills necessary for a career in engineering. A solid grounding in mathematics is the most valuable such skill and also the most difficult to develop. Many inner-urban programs meant to revitalize or strengthen mathematics education focus on students in middle or high school. At this grade level, many students already feel they have no skill with mathematics; they have a correspondingly poor attitude towards mathematics that makes any attempt to improve the mathematics curriculum more difficult. A more useful, if longer term, approach is to implement change from the bottom (elementary school level) up, rather than middle or high school, where ultimate change is so strongly desired.

The authors have introduced a supplemental program in the Pontiac School District in Pontiac, Michigan to revitalize mathematics beginning with the elementary school level (K-5). The supplemental program, Kumon Mathematics, is used by millions of school children in Singapore, Japan, and Korea; countries that score the highest on worldwide mathematics achievement tests. Kumon Mathematics appears to provide an ideal structured support in mathematics for at-risk children who receive little or no help at home, and who present the teacher of any given grade with a great variety of achievement levels. It allows students to achieve frequent and repeated successes. This paper provides details of the Kumon Mathematics methodology as well as a description of the first year's efforts in the program, which currently involves some 1,500 elementary school children in the Pontiac School District.

Introduction and Motivation

The Pontiac School District is an inner-city, largely minority district surrounded by suburban, largely white school districts of varying levels of affluence (Figure 1). The performance of Pontiac students on the mathematics section of mandated state tests (Michigan Educational Assessment Program—MEAP) and nationally normed tests is significantly below that of students in the surrounding districts. For example, in the statewide ranking of the percent of students who pass the mathematics portion of the MEAP test, Pontiac ranks in the lowest 1.3% of all Michigan school districts, while six of the seven school districts surrounding Pontiac rank in the highest 10% statewide and the seventh district ranks in the 61st percentile (Table 1). Pontiac has a total of 63.9% of school children receiving a free or reduced-price lunch. Immediately adjacent to Pontiac is the virtually all white Rochester School District, with only 3.2% of students receiving a free or reduced price lunch. Oakland University (OU) lies on the boundary between Pontiac and Rochester.

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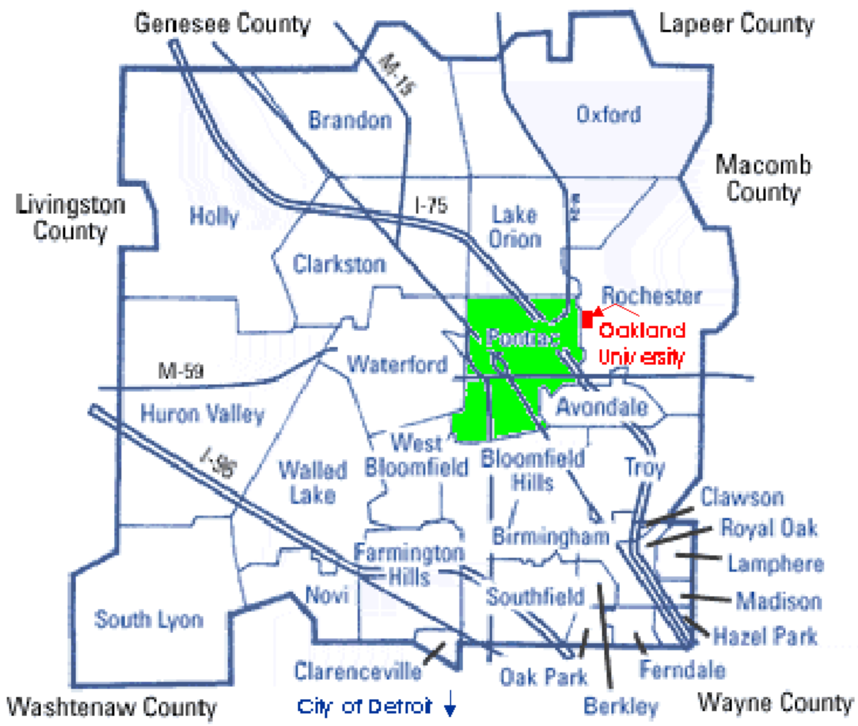

Figure 1: Pontiac School District, near Detroit in southeast Michigan.

Table 1: Year 2000 mathematics test scores for Pontiac and surrounding school districts.[1]

	MEAP* Math Scores, % Passing	MEAP Math State Percentile	ACT Math Mean Score	ACT Math State Percentile	PSAT** Math Mean Score	PSAT** Math State Percentile
Pontiac	34.9	1.3	17.0	2.5	40	2.2
Rochester	91.1	97.1	23.3	96.0	52	83.6
Avondale	84.1	92.4	22.3	88.7	51	70.1
Bloomfield Hills	91.6	97.6	24.3	98.9	53	86.1
W. Bloomfield	86.7	94.7	22.2	86.2	51	71.1
Waterford	73.6	61.3	20.0	32.1	47.0	28.3
Clarkston	82.8	90.4	21.9	81.8	55.0	96.4
Lake Orion	84.4	92.9	21.8	78.8	52	81.8
State Average	69.1	----	20.6	----	49	----

*MEAP is the Michigan Educational Assessment Program.
**SAT I and II scores unavailable from Pontiac for the year 2000.

In the 2001-2002 academic year, in an effort to bring minorities into OU's professional schools, Oakland implemented a pilot mathematics program in Pontiac with the strong support and commitment of Dr. Walter Burt, Pontiac's Superintendent of Schools. This program is based on curriculum and methods—Kumon Mathematics—in wide use in the Asian countries that are continuously among the top scorers in international mathematics achievement tests.

The Need for a Parallel Path in Math in an Inner-Urban School District

Unlike subjects such as English and geography, mathematics is an highly sequential discipline. Those who 'miss the boat' for example, in multiplication or division will be completely lost later, when studying fractions and decimals. Children in an inner-urban classroom typically span a broad range of achievement, abilities, and skills—often far more so than in surrounding districts. Most of the commercially available text-curriculum packages make little or no allowance for large variations in achievement levels within a given classroom or grade. Those students who are far behind grade level mathematically are often left to fall further and further behind, because there is no mechanism for them to catch up to their peers. When enough children are in this situation, the entire peer group suffers.

The Kumon methodology outlined in this paper provides an ideal parallel path that allows underachieving children in mathematics to catch up to the level at which they should be working. Simultaneously, it allows 'super-achievers' and normal achievers to practice, improve, and excel at their own levels. Indeed, the method by which Kumon is taught—through the use of thousands of carefully structured, logically connected worksheets—represents an excellent individualized supplement to standard textbooks.

The Kumon Method

'Kumon' mathematics is a methodology of enriching mathematics instruction that was originally developed by Toru Kumon, a Japanese mathematics teacher, as a tool to help his son—a second-grader who was struggling with mathematics in the 1950s. The method has traditionally been taught at after-school learning centers, where parents enroll their children on a monthly tuition basis for remediation or enrichment through a supplemental learning opportunity. Kumon complements the school curriculum without simply doing 'more of the same.' (To support the current standards-based commercial mathematics program, Pontiac's elementary schools currently use Houghton Mifflin Math Central.) Kumon Mathematics emphasizes calculations, which the National Teachers of Mathematics (NCTM) has recently recognized to be a weak aspect of American teaching.[2, 3] In April 2000, NCTM revealed that it learned a key lesson in developing its standards by stating publicly that "Students must be fluent in arithmetic computation – they must have efficient and accurate methods and understand them. Students should know their basic addition, subtraction, multiplication, and division."[4]

Kumon seeks to make computational skills automatic, leaving students with time to work on more complicated and richer connections within mathematics. As a result, such basic math functions are performed with little or no conscious thought.[5] Wittman, *et al.*[6] believe such 'over-learning' reduces anxiety and point out that "students whose mathematical problem-solving performance is hindered by continual need to review facts and procedures will learn to view mathematics as an anxiety-provoking experience."

As a supplementary education program, Kumon's methods assist with improving test taking skills. Two factors in successful test taking are speed and accuracy, neither of which have been typically taught or developed by schools. Kumon uses timing requirements, accuracy of answers, and on-going feedback as an integral part of its methodology.

The Kumon method uses a sequential curriculum made up of worksheets to move the student though a concept in small linear steps. The curriculum has 23 progressive levels, each level of which contains 20 sets, with each set consisting of 10 worksheets. The earliest levels cover pre-counting skills, while the highest levels move through college level calculus and statistics. The student moves on to the next level as mastery of the previous level is demonstrated by meeting the timing and accuracy requirements. Kumon encourages the student to develop his or her memory, learn and store computational procedures, and be independent learners.

After an initial placement test, students begin their Kumon experience at a level somewhat below their true capabilities. Students practice at this level until they can complete the worksheets assignments within a predetermined time limit, and with few mistakes. This beginning level is often described at the 'just right' point where the student can become used to the routine of the program. As each student realizes success and satisfaction, motivation increases and the student is moved on to the next worksheet assignment. In the daily study routine of the Kumon method, the student experiences much comfort alongside a little bit of challenge each day. In this cycle the student gains experience, builds confidence and develops a 'try more' attitude. Time and accuracy on the end-of-level achievement tests determine whether a student is ready to move on to the next worksheet level. Bandura[15] would describe this as the "self-regulated learner."

Students are guided through the assignments, and are asked to repeat the worksheets where they experienced difficulty or made a number of mistakes. This activity provides the students with what Ericsson, *et al.*[9] calls "deliberate practice." In effect, practice reinforces learning and provides the student with opportunities to re-learn steps he or she may have forgotten. Research supports evidence that basic math skills mastered during elementary grades strengthen the probability of success in the upper level mathematics.[10] Teacher-centered methods such as Kumon are used as an aspect of comprehensive math instruction in countries with high-achieving students. Repetition and practice are significant factors in improving student achievement, whereas reform movements such as constructivism and discovery learning have been known to deemphasize calculation.[11]

A basic tenet of the Kumon program is getting the correct answer as quickly as possible. The goal for every worksheet is perfect work in standard time.
Moreover, worksheets are graded as soon after completion as possible to provide students rapid feedback about their efforts. Kumon worksheets teach speed and accuracy, emphasizing the efficiency of learning. This approach is ideal practice for test taking. Getting the right answer quickly allows the test taker to use the newly available time for tougher or skipped questions. Also, the number sense and mental calculation that results from working the Kumon program are ideal for solving contextual problems that require higher-order mathematical thinking and reasoning. Benjamin Bloom[12, 13] advanced the concept that sufficient time, appropriate instruction and corrective feedback will enable

95% of the students to learn what only 20% were thought to be capable of. Kumon employs all three elements.

Kumon facilitators rely on the students' work and success to drive student learning activities. Facilitators become a "guide on the side" rather than the "sage on the stage."[14] The instructor is urged to remain sensitive to the attitude of the student in order to assess and maintain the best balance of mastery and challenge. Using the Kumon methodology, students must correct their errors, developing self analytical skills. They use this gained knowledge in acquiring the skill and concept on the next worksheet assignment. Ausubel[16] noted that learners need long term involvement and practice "for acquiring many skills and concepts that do not occur frequently and repetitively enough in a more natural setting."

While most of the current 170,000 students using the Kumon method in North America attend an after-school franchised center, Kumon has a promising history in schools as well. Approximately 7,000 students now use Kumon during regular school hours in Texas, Alabama, Oklahoma, and other states. With Kumon supplementing the school-wide math program, students gain much more from their classroom instruction. Since 1990, schools have emphasized teaching toward national and state standards in each subject area.[7] As a result, in math, the focus has been on broad concepts, understanding of complex problems, and the use of calculators. The Kumon method complements this instruction with the opportunity to practice and apply basic math, thus enabling students to reinforce their classroom learning in their regular mathematics curriculum.

Kumon instructors and classroom teachers have learned that students gain much from structure and practice. The initial part of the Kumon curriculum is focused around a series of worksheets that form the foundation for learning of addition, subtraction, multiplication, and division. Studies using MRI technology have found great brain activity in the prefrontal cortex of both cerebral hemispheres when doing calculations of additions, subtraction, and multiplication, all of which has been found to be related to the types of changes seen when true mastery of a concept occurs.[8]

The 2002-2003 Kumon Program in Pontiac and Related Programs Elsewhere

In early 2001, faculty from Oakland University approached Dr. Walter Burt, the Superintendent of the Pontiac School District, with the proposal that the district consider using Kumon in their classrooms. Dr. Burt was not only willing—he immediately suggested a number of different ways in which the program might be experimentally introduced. Eventually, it was decided to try a twenty-week Kumon pilot project involving 120 students at two elementary schools, which could be operated as part of Pontiac's after-school Synergy program. Project Synergy is a voluntary after school program, scheduled in ten week sessions, that includes four content areas: tutoring, enrichment, dinner type meal and homework help. Kumon mathematics was used as the tutoring component. Using Kumon in this fashion was a collaborative effort between the Pontiac School District, Oakland University, and Kumon, North America—with Oakland University providing two to three undergraduate students in each school to implement the program on a day-to-day basis. The twenty-week program demonstrated student improvement through an increase in correctly solved problems on a simple test, accompanied by an increase in speed with which children were able to solve problems. Attendance in the Synergy program was voluntary, as students could choose alternative enrichment activities. Roughly three quarters of the children chose to continue the Synergy program after the first ten week session.

Kumon was new and unknown to most of the local after-school staff. In the first months, teacher engagement was poor—for example, children were frequently called out of class during Kumon sessions to attend other functions, such as basketball or dance. The Kumon philosophy of daily and sustained practice and feedback steadily became more widely understood by the Pontiac Synergy teachers. Later in the program, particularly as rapport began to develop with the OU students teaching Kumon, Pontiac teachers began to assist in grading Kumon worksheets or keeping the children on task.

The pilot project served to give Pontiac school district administrators a good look at Kumon's methodology, and provided some preliminary evidence of its efficacy. It also demonstrated Oakland University's commitment. In May 2002, school administrators (including the Superintendent), university faculty, and Kumon staff visited Sumiton Elementary/Middle School in Sumiton, near Birmingham, Alabama to observe the Kumon program being implemented during regular school hours.

Sumiton has been using the Kumon-developed mathematics curriculum for all of its K-5 students during the first period of each day for the last 12 years. Sumiton's population is very transient—with a turnover of roughly 40% each year—and the entire county is well below poverty level. The median household income in the area is $33,247. SAT-9 scores reflect findings indicating Sumiton students do considerably better than the other students in the county—sometimes even exceeding state averages, (Figure 2, Table 2). The 10-point or more spread between Sumiton students and those of the rest of the county in grades three through six suggests that the Kumon mathematics program has a very positive impact on the students in this school.

Table 2: SAT-9 Mathematics scores for Alabama as a whole, Walker County, and Sumiton Elementary School, 2001.

Grade	Alabama State Total	Walker County Total	Sumiton Elementary School
3rd	56	30	50
4th	58	51	61
5th	57	47	54
6th	56	48	58

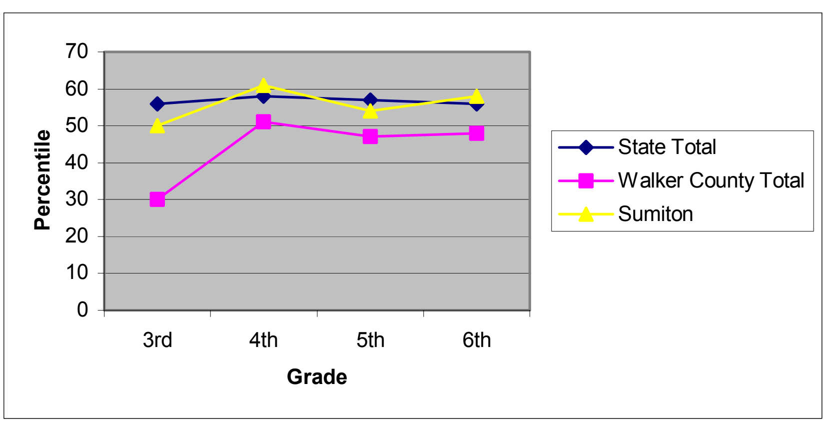

Figure 2: Sumiton Elementary and Middle School SAT9 results, by grade level (Year: 2001). Note the degree by which Sumiton results exceed those of the surrounding Walker County schools.

It is worthwhile here to also point out results using Kumon at other locations, such as PS 180 in Harlem, where the Kumon group was found to be 0.59 standard deviation units ahead of matched peers in mathematics performance. In the Harlem study, Kumon students generally took less time to complete multi-level tests when compared to matched students. This allowed for greater attempts of more items and more difficult items in the timed test.[17]

Additionally, studies in Oklahoma found 65% of Kumon students mastered addition and subtraction, compared with only 10% of those students without Kumon instruction. (Following the Oklahoma students into the next school year, the mean score for math concepts on the Iowa Tests of Basic Skills (ITBS) from the Kumon Group was 50.8, compared to 23.8 for the group that did not have Kumon the previous year. This indicated that the results had a lasting effect.[10])

Study results such as these and, most importantly, personal observation by Pontiac personnel of the impressive program and results at Sumiton were the final elements behind Pontiac School's decision to implement Kumon mathematics during part of the school day in the regular academic school year in four of their elementary schools. By selecting only four of the thirteen elementary schools in the district to begin the program, student improvement in achievement could be compared with other Pontiac elementary schools that were not involved in the Kumon Project. A subsequent visit was made to Sumiton eight additional teachers and principals—two representatives from each school—to observe and confer with the teachers and administrators in Sumiton.

In June of 2002, approximately 45 teachers from three Pontiac Elementary Schools were trained in the Kumon methodology during a six and a half hour session by staff from the Kumon, North America Educational Services Group, with assistance from undergraduate students from Oakland University. Teachers were invited to make an appointment and visit a local after-school Kumon Math and Reading Center to observe first hand the methodology in practice. The teachers were given worksheets assignments for completion over the summer to develop a deeper understanding of the linear progression of the material. On September 4th, 2002, an additional 37 teachers were trained in the Kumon method.

On September 9th, 10th, and 11th, 2002, over 1000 students were given Kumon placement tests at Twain, Franklin, Crofoot, and Herrington elementary schools, with assistance from Kumon, North America staff. In-service training was provided to the teachers to review the process of testing, comfortable starting point, planning, grading and monitoring student progress. Lesson plans were created for each individual student, depending on their placement test results. Individualized daily class assignments were created for each student. Teachers were asked by administrators to schedule Kumon for the first 20 minutes after the bell each morning. (A number of schedules did vary, however, due to the frequent tardiness of students in several classes.) A breakdown by grade of students enrolled in Kumon in each school is shown in Table 3.

Table 3: Breakdown by grade of students enrolled in Crofoot, Twain, Herrington, and Franklin elementary schools in Pontiac, Michigan, during the 2002-2003 school year.*				
Grade	**Crofoot**	**Twain**	**Herrington**	**Franklin**
Kindergarten	28	56	56	56
1st	56	56	56	50
2nd	28	50	70	56
3rd	56	56	67	75
4th	28	60	85	70
5th	28	60	85	0
Other	0	30	0	0
Total	224	368	419	307
*Typical class size is 28-36 students per teacher.				

The level of teacher support and acceptance is a key variable in the success of any meaningful school-wide educational program. In Pontiac, some teachers enthusiastically took to the program and proudly discussed the differences they began seeing in their students' abilities. Other teachers found the addition of the program very imposing and were reluctant to accept it. The advantages and disadvantages of the program, as summarized from comments of several Pontiac administrators, are as follows:

Advantages:

1. Kumon provides practice and instruction to each individual student at precisely that student's level. This benefits all learners, whether advanced or remedial. Under the standard program, if a student has not properly learned a topic, there is no way for that student to receive remedial instruction once the teachers move on. Additionally, under the standard program, outstanding performers have no way to move ahead and remain challenged.
2. Kumon provides for automaticity. In other words, students become comfortable and adept with basic mathematics facts. Under the standard program, students cannot quickly recall the fundamental facts they need to solve complex word problems.
3. Kumon forces students to begin to think and work independently. Students are required to pick up their worksheets and begin working on their own at a designated time.
4. The younger the students were, the more they excelled at the program. Kindergartners and first graders in particular showed remarkable improvements in the understanding of basic mathematics facts compared with students from previous years who have not been involved in Kumon.

Disadvantages:

1. Each child's work must be graded each day.
2. Teachers must be trained in the methodology.
3. Gains are steady, but not instantaneous.

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Implementation of any school-wide program can be complex. Regular visits to the schools by Kumon staff and occasional visits by Oakland University faculty found varying degrees of commitment to the Kumon program and varying degrees of proper implementation of the methodology. One school used the program for nearly three months before it was discovered that the Kumon worksheets, although being graded, were not being returned to the students for correction. Consequently, virtually the same errors by students were noted at the next-level testing (approximately three months later) as were noted initially.[†] Some teachers refused to believe that their students had placed at as low a level as the initial placement test had indicated. (Some fifth graders, for example, did not know basic addition facts and so were initially placed at second grade Kumon levels.) Consequently, these teachers started their students at a higher level than should have been the case, and the students did poorly on the test at the end of the level. (Similar fifth grade students who were started at the appropriate second grade level, on the other hand, did show substantive improvements in their test scores.) One school, although they had paid for and committed to the program, delayed implementation for a number of months for various reasons.

Other problems related to Kumon implementation are more deeply associated with how reflective, deliberate, and engaged some teachers are in their normal teaching practice. For example, instead of circulating among the students when Kumon was in session to ensure that the students were not counting on their fingers, or to answer questions or encourage their students, some teachers used the Kumon session as an opportunity for non-instructional duties or to passively observe. Such less strongly engaged teachers thought that the time working with the worksheet would be enough to ensure success when really the 'guide on the side' needs to be ensuring students are meaningfully engaged in each problem. Other teachers were at a developmental point on their teaching practice where Kumon was the first time any daily feedback to students was a necessary part of a program. Some did not recognize the importance of this daily feedback. For example, some did not see the full benefit of allowing children to see and correct their mistakes—that was simply seen as unnecessary work. These examples of ineffective implementation demonstrate that Kumon implementers must ensure that early-on there are ongoing opportunities to gain insight into the critical and powerful elements of the Kumon method. Additionally, strong and continual motivation from the school's principals is critical in keeping strident comments from the dissatisfied few in check as the previous culture of low expectations with no daily paper grading (or other student feedback) undergoes change. As one principal put it: "I have made it clear to my teachers that as long as I am principal in this building, Kumon will be done in every classroom, every day. The 'extra' work in grading papers and giving proper feedback is *part of any normal teacher's job*."

These problems are laid forth to give a realistic idea of the scope of the undertaking in implementing any significant educational reform in mathematics within any change-resistant school culture. Indeed, it is precisely these largely start-up, but sometimes sustained, problems that often deter both school districts and universities from attempting to make any substantive changes. Fortunately, Pontiac's school district

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[†] Rapid feedback to students is essential in the success of the program. Student work should be graded as quickly as possible (either that day or the next day, or at latest within a week's time) to provide immediate feedback the student so that they may correct their mistakes before they become an ingrained habit.

administrators are committed to long-term deep-seated educational reform. They have proven their commitment to continuous improvement in their ability to deliver quality mathematics instruction, while recognizing that there will always be implementation problems as schools gradually adjust to a completely different, far more focused effort that simply does not allow for a culture of low expectations. Recently, a fifth Pontiac elementary school began also implementing Kumon in the classrooms. Discussions are also currently underway to begin using Kumon as an adjunct remedial program in high schools and junior high schools.[†] By next year, comparative results of Pontiac School District testing will be available—they will be published in a subsequent article.

Opposition from 'Progressive' University Level Academicians in K-12 Education

Our small group of engineering faculty began this program because one of us (Oakley) had had her own two children enrolled in Kumon mathematics for nearly ten years. The simplicity and efficacy of the Kumon curricular materials, along with Pontiac's willingness to try a promising program, and Kumon, North America's diligent support, are what inspired us to use this program to begin revitalizing mathematics education in the Pontiac School District. It was felt that if Pontiac's students could develop mathematical confidence, independence, knowledge of computation and basic math facts, at an elementary school level, they could have more meaningful success in mathematics long term.

Perhaps surprisingly, the fiercest resistance to the Pontiac project in implementing supplemental mathematics instruction using practice and repetition came from university-level K-12 education academicians. Being engineering academicians who learned and excelled in math in fair portion through practice and repetition, we were shocked at the antagonism our efforts encountered. Most academicians in disciplines that actually use mathematics on a daily basis have no idea that this antagonism to practice and repetition exists on the part of K-12 education-related academicians. Indeed, when we explained the situation to our colleagues in science, mathematics, and engineering, as well as to engineering students and engineers, the reaction was invariably disbelief.

Some background is in order. In 1989, a group of mathematics education experts, under the auspices of the National Council of Teachers of Mathematics, launched a campaign to define and standardize the content and teaching of mathematics. Despite the fact that NCTM's 2000 retooling of their standards suggests a significantly more balanced approach to teaching mathematics, many are not convinced. The momentum of the original document has created quite a bit of controversy around skills instruction. In this climate, any mention of skills instruction or a supplemental program that focus on that aspect of mathematical learning may be seen as either a lack of faith in students' cognitive ability or ignoring our changing world. Complaints about the still broadly followed older NCTM campaign center about several areas (the following points are quoted from Tom Loveless):[18]

[†] Research conducted at PS 180 in Harlem, NY showed similar initial findings in a program implemented during the 2001-2002 school year. At the end of the year, however, there appeared to be greater acceptance by the majority of participating teachers compared to mid-year.[8]

Teaching: NCTM math embraces the longstanding doctrine of progressive education. Student-initiated learning is favored over teacher-led instruction. Students spend a lot of time playing math games in small groups. The process of problem-solving is valued over right answers because right answers don't have an objective existence; they are "constructed" by learners. But what happened to reformers' insistence on real-world math? From engineers to airline pilots, people use mathematics to model the world in which they actually work, not to construct their own, more accommodating versions of reality. State and district policies that have followed the NCTM standards tend to present reform as religion. And conventional practices appear as sins: teachers delivering direct instruction; students individually working on pencil-and-paper problems at their desks; corrected work (wrong answers clearly marked wrong) cycling back and forth between teacher and student.

Downgrading of basic skills: Until recently, the math curriculum from kindergarten through 8th grade focused on basic skills: in particular, learning how to use four forms of number (integers, fractions, decimals, and percents) in performing four operations (addition, subtraction, multiplication, and division). Students who mastered the 16 manipulations embedded in this knowledge, including when and how to employ them in solving problems, were in good shape to move on to higher math.

Not anymore. Basic skills are now de-emphasized. They represent the facts-based learning that math reformers abhor. How will students get the basics? Memorization isn't an option because it's boring. The hope is that basic facts will seep into students--by playing games, working with manipulatives (blocks, beans, and counting sticks), and by using calculators. It's even inferred that computational skills are becoming unnecessary with calculators in wide use. Besides, math reformers argue, the insistence that students learn these skills before progressing in the curriculum condemns countless youngsters to a low-level, repetitious math program.

The problem with this argument is that it's based on conjecture. We don't know if learning by osmosis really works, nor the long-term consequences of students' failing to master basic skills. We don't know whether students who can't grasp, say, the equivalence of 0.25 and 25 percent actually go on to successfully learn calculus. Research has yet to document large numbers of students who fly through algebra but are clueless when it comes to fractions. Moreover, parents worry when their 5th graders can't multiply single-digit numbers without pocketfuls of beans and sticks. Teachers are concerned that the mastery of basic skills signifies something more than computational proficiency, that students who learn these facts to an automatic level also gain a deeper knowledge of mathematics, a sense of number unfathomable to those who don't know them.

Individuals and groups considering supplementing existing curricula through the use of tried and true ‘old-fashioned’ techniques, as embodied in part by the Kumon methodology, should be prepared to encounter resistance from K-12 educators or academicians with whom they may wish to collaborate. It should be noted here that we are by no means suggesting that progressive mathematics education is bad—indeed, it has many positive attributes in developing creative skills. However, we believe some balance is necessary—without a modicum of practice and repetition, it is virtually impossible, particularly for children in disadvantaged school districts, to excel in higher level mathematics.

The Pontiac Kumon Partnership is clearly committed to ensuring that all students learn both skills and concepts. It is working to help students develop efficiency, accuracy, and flexibility as they deal with simple, complex, traditional, and real-world problems. The team supports a balanced approach to teaching mathematics and remains committed to giving students these valuable daily Kumon sessions as a critical supplement to their core math instruction. A close look at the Kumon worksheets will reveal that students are working with skills, concepts, mental arithmetic, memorization, knowledge, and ways of thinking. All of this is foundational to a true understanding of mathematics.

Conclusions

Many inner-urban school districts may benefit from the addition of a supplemental mathematics program. Kumon's mathematics curriculum appears to provide an excellent alternate path for learning mathematics for those students who are performing below grade level. Concomitantly, the program enhances mathematics skills for those who are at or above grade level, as it provides practice at an individualized level determined by each student's performance on an initial placement test. Supplementary practice programs, particularly as exemplified by the careful, gradually progressive worksheets developed by Kumon, provide an excellent opportunity for students with a wide range of abilities and skill levels to practice and apply basic math. This enables students to reinforce their classroom learning in their regular mathematics curriculum.

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