

EFFECT OF “EVERYDAY MATHEMATICS” CURRICULUM
ON STUDENT MATH PROFICIENCY RATES
AMONG MICHIGAN PUBLIC SCHOOL DISTRICTS

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“Everyday Mathematics” (EDM) is a widely-used mathematics curriculum for grades K-6. EDM was developed as part of the University of Chicago School Mathematics Project, and utilizes a “constructivist” approach to learning. Advocates of EDM assert that it enables students to gain a more conceptual understanding of mathematics, and encourages them to develop multiple algorithms to solve problems. It has been used by the Ann Arbor Public Schools in grades K-6 for a number of years.

Because EDM does not emphasize rote memorization (of the multiplication table, for example), and utilizes calculators in the classroom as early as kindergarten, many parents (and some educators) perceive EDM as being “soft” on computational skills. Also controversial is its “spiral” approach to the math curriculum, in which students experience concepts in relatively short units, move on to other concepts, and then cycle back to the original concept later in the school year. This has led to the criticism that EDM is “an inch deep and a mile wide”. The concern is that students do not become proficient in the “basics” before moving on to other material.

Dr. Todd Roberts, superintendent of the Ann Arbor Public School District, has stated his commitment to “data-driven” decisions regarding the mathematics curriculum. Toward this end, the following research investigation was conducted to provide data regarding the effectiveness of EDM, compared with other mathematics curricula currently being used in the State of Michigan.

The Investigation

This investigation utilized the national on-line database www.schoolsmatter.com, a service provided by Standard & Poor. The database includes highly detailed information (including demographics, achievement scores, funding, enrollment, etc.) for over 100,000 individual schools and 14,000 districts from all 50 states. The site permits side-by-side comparisons of schools and districts. Data is current through the 2005-2006 school year.

This investigation was performed at the district level, and was confined to districts with total enrollment of 5,000 students or more. The reason for this is that it was felt that the characteristics of small (primarily rural) districts are sufficiently different from the Ann Arbor district to limit the usefulness of such comparisons. Similarly, the Detroit School District was excluded from analysis, due to its size (nearly five times as large as the next largest district), and the fact that the Detroit District faces a wide variety of significant

structural and economic problems that make it a special case. The result was a database consisting of 75 school districts ranging from 5,000 to 25,000 students.

Although schoolsmatter.com does not provide the names of the math curricula used in the various districts, the Ann Arbor Public School District has provided a list of schools in Michigan that use EDM. This list was used for purposes of the investigation. No attempt was made to validate the accuracy of the list, so it is possible that some additions and deletions may have been missed.

Methodology

The investigation attempted to answer the following questions:

- What demographic variables correlate most closely with student achievement in mathematics?
- Is there a correlation between student achievement and the use of “Everyday Mathematics” as the core elementary school curriculum?
- Are there variations in the effectiveness of “Everyday Mathematics” among demographic and economic groups?
- What does the data show regarding the overall effectiveness of “Everyday Mathematics”?

The data element used for achievement in mathematics was “percent of students proficient in math”, based on the state-wide MEAP test. This measurement was recorded at the district level, and represents all grades. The investigation was not able to distinguish between proficiency rates for elementary, middle and high school. Since EDM is in use only for grades K-6, the effect of this curriculum on middle- and high-school students may be clouded by other factors.

Results

The following chart summarizes selected demographic data for the districts included in the study.

CHARACTERISTICS OF 75 LARGE MICHIGAN SCHOOL DISTRICTS	
Category	Average for All Districts
Enrollment	9,427
Operating Expenses Per Student	\$8,761
Percent Math Proficiency	67.2%
Percent Non-Asian Minority	19.2%
Percent Economically Disadvantaged	26.2%
Percent Single Parent Households	9.4%
Percent Households with Parent Holding Bachelors Degree or Higher	28.7%

Of the 75 districts included in the study, 30 (or 40%) currently utilize EDM while 45 use some other product for their math curricula. Of the 30 who use EDM, one district (the Grand Blanc District) does not utilize it in all its elementary schools. Because of the difficulty in sorting out which schools in the Grand Blanc District do or do not use EDM, this district was dropped from the analysis. The following chart summarizes math proficiency for districts that use EDM and those that do not:

STUDENT MATH PROFICIENCY		
Category	District Using EDM	Districts Not Using EDM
All Students	70.0%	63.8%
Male Students*	71.9%	64.3%
Female Students*	71.7%	63.7%
White Students	76.5%	70.0%
African-American Students	43.0%	36.2%
Economically Disadvantaged Students	49.3%	46.9%
Districts	30	45

* The number of male and female students per district was not available; therefore, these statistics represent the average of male/female student proficiencies for all districts. The average was not adjusted for differences in district size, causing a slight distortion. This is the reason the averages for both male and female students are higher than the average for “all students” (which does reflect differences in district size).

This data suggests that, taken as a whole, students who attend districts where the math curriculum is based on EDM do better than students from districts that use other math curricula. Furthermore, the difference in student achievement between EDM and non-EDM districts applies to male and female students, white and African-American students, and students who are economically disadvantaged.

The above data does not take into account differences among the various school districts. Some of the differences in math proficiency between districts that do and do not use EDM may be related to the demographic composition of the districts. In order to control

for such factors, it is first necessary to identify those characteristics that correlate most closely with math proficiency.

A simple regression model was used to test correlations using various demographic characteristics as independent variables, and “student math proficiency” as the dependent variable. The strength of the correlation between the independent and dependent variables is expressed as a “coefficient of correlation”, or R^2 . The higher the R^2 value, the stronger the correlation. Generally, an R^2 of 0.5 or greater is indicative of a strong correlation.

The most statistically significant independent variables predictive of “math proficiency” were:

- Percent of district students who are economically disadvantaged (as measured by eligibility for subsidized school lunch program)
- Percent of single-parent households
- Percent of households in which one or more adults holds a bachelor’s degree or higher
- Percent of non-Asian minority students in district (African-American, Hispanic, Native American or Multi-Racial)

Interestingly, there was no correlation between expenditures per student and math proficiency. Results are summarized in the following table:

CORRELATION WITH PERCENTAGE MATH PROFICIENCY	
Independent Variable	Coefficient of Correlation to Percent Math Proficiency (R^2)
Percent of children in district who are economically disadvantaged	0.767
Percent of children in district living in single parent households	0.620
Percent of children in district in households in which one parent holds bachelor’s degree or higher	0.504
Percent of children in district classified as non-Asian minority	0.503
Instructional expenses per student	0.001

Districts were then divided into three groups for each of the four independent variables identified above. This permits a direct comparison between districts that are similar in racial, educational and economic characteristics, but which use different math curricula. Results are summarized in the following tables:

MATH PROFICIENCY BY PERCENT OF STUDENTS WHO ARE ECONOMICALLY DISADVANTAGED		
District Ranking	Use EDM	Do Not Use EDM
Least Disadvantaged Third	83.9%	75.8%
Middle Third	72.0%	66.1%
Most Disadvantaged Third	54.9%	52.7%

MATH PROFICIENCY BY PERCENT OF STUDENTS LIVING IN SINGLE PARENT HOUSEHOLDS		
District Ranking	Use EDM	Do Not Use EDM
Least Single Parent Households	79.0%	75.3%
Middle Third	75.4%	67.4%
Most Single Parent Households	56.5%	52.7%

MATH PROFICIENCY BY PERCENT OF STUDENTS ONE+ PARENT HOLDS BACHELOR'S DEGREE OR HIGHER		
District Ranking	Use EDM	Do Not Use EDM
Highest Level Parent Education	81.7%	66.5%
Middle Third	66.5%	67.5%
Lowest Level Parent Education	57.6%	55.4%

MATH PROFICIENCY BY PERCENT OF NON-ASIAN MINORITY STUDENTS IN DISTRICT		
District Ranking	Use EDM	Do Not Use EDM
Fewest Minority Students	80.3%	73.3%
Middle Third	76.4%	65.2%
Most Minority Students	59.5%	52.9%

The above data strongly suggests that the use of EDM results in higher math proficiency, regardless of the socio-economic composition of the school district. The advantage of EDM over other math curricula appears to be strongest in those districts with the highest socioeconomic status, highest level of parent education, and fewest single-parent households. However, EDM's advantage persists, albeit to a lesser degree, among middle- and lower-ranking districts. The lone exception to this trend is for "Parents With Bachelor Degree or Higher" where, for middle- and lower-third districts, there is no significant difference in math proficiency between EDM and non-EDM districts.

Another topic of concern is the role of EDM in addressing the so-called “performance gap” between white and African American students. The following table summarizes the “performance gap” for various categories:

PERCENT DIFFERENCE IN MATH PROFICIENCY BETWEEN WHITE AND AFRICAN-AMERICAN STUDENTS		
Category	Districts Using EDM	Districts Not Using EDM
All Districts	31.4%	33.3%
Percent Economically Disadvantaged		
Least Disadvantaged	31.9%	47.7%
Middle Third	30.8%	35.7%
Most Disadvantaged	26.1%	26.6%
Percent Single Parent Households		
Fewest Sing Parents	35.5%	40.15%
Middle Third	33.4%	44.3%
Most Single Parents	22.7%	23.0%
Percent Households with Parent Holding Bachelor’s Degree		
Highest Education	37.9%	40.6%
Middle Third	28.1%	36.5%
Least Education	21.7%	31.2%
Percent of District Belonging to Non-Asian Minorities		
Fewest Minorities	42.0%	49.9%
Middle Third	29.2%	29.1%
Most Minorities	24.1%	25.0%

Overall, the use of EDM in a district appears to have the effect of reducing the “performance gap”. The difference between EDM and non-EDM districts is most pronounced for those districts with the most advantageous demographics, and the “performance gap” is about the same for EDM and non-EDM districts in the bottom third of the economic indicators.

Conclusions

The data strongly indicates that students in districts that use EDM are more likely to achieve “proficiency” in the math. Furthermore, the higher rate of math proficiency for districts using EDM appears to be independent of other variables, such as race, economic status and parents’ education.

The improvement in test scores associated with EDM seems strongest in districts characterized by higher socioeconomic status, fewer single-parent households, less racial diversity and higher-educated parents. The “advantage” associated with EDM is still present in districts with less favorable demographics, but the difference in test results is less pronounced. It can be speculated that, for the most disadvantaged districts, it matters little which math curriculum is used; the challenges associated with poverty overwhelm all other considerations.

The data does not break out proficiency rates for students from single-family households or students by parents’ level of education. The effect of these variables could only be examined indirectly, by comparing district-level proficiency rates for districts with different characteristics. This does not address the question of whether, for a given district, students from single-parent households do better (or less well) under EDM than other curricula. The same is true for level of parents’ education. Because EDM involves a significant amount of parental participation, it would be reasonable to hypothesize that children from highly-educated, two-parent households would fare better with EDM (compared with other math curricula) than children from less-educated, single-parent households. The data is not inconsistent with this hypothesis, but there is no conclusive evidence that this is the case.

The data demonstrate that use of EDM is strongly associated with a reduction in the “achievement gap” between white and African-American students. It is worth noting that the reduction in the gap is the result of significantly higher math proficiency among African-American students (white students also had higher math proficiency with EDM, but to a lesser extent). Similarly, the relatively small “achievement gap” between male and female students was reduced to virtually zero in districts using EDM.

While this study is unlikely to end the controversy surrounding EDM, opponents of EDM will be hard pressed to find anything in this data to support their criticism. It should be kept in mind that this study considered grouped data only. It did not address the question of how individual students react to EDM. Parents may still be the best judges of how well EDM meets their children’s needs. Still, when taken as a whole, the results of this study represent a solid endorsement of EDM as a math curriculum for elementary students.

