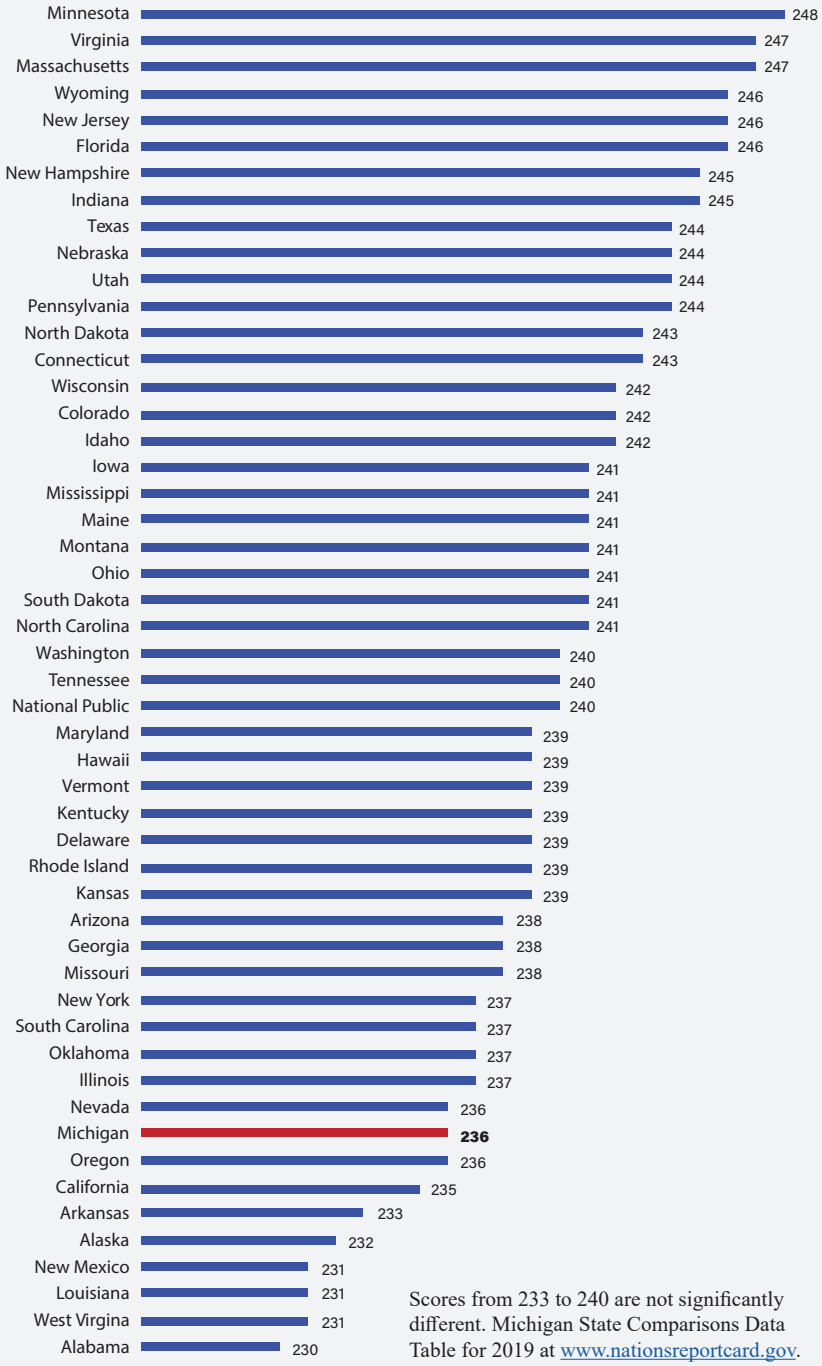
General Education Leadership Network

From Lagging to Leading

URGENCY IN THE NUMBERS: The Case for Early Mathematics

2019 NAEP Grade 4 Mathematics National Rankings



Scores from 233 to 240 are not significantly different. Michigan State Comparisons Data Table for 2019 at www.nationsreportcard.gov.

Michigan's Early Math Crisis

Michigan 42nd in 2019 NAEP Mathematics Rankings

Michigan remains one of the lowest performing states in the nation, with only five states performing significantly lower on the 2019 National Assessment of Education Progress (NAEP) 4th grade mathematics assessment. This trend has been consistent (and worsening) since 2009.

- The 2019 NAEP assessment shows that 65% of all Michigan 4th grade students are not proficient in mathematics, which is considered significantly lower than the national public average.
- The 8th grade NAEP assessment is even worse, with 69% of Michigan students not proficient in mathematics.
- Michigan students rank 42nd in the nation overall on the 2019 4th grade mathematics NAEP assessment, fully 10 positions below our national rank for reading.
    - Michigan's economically disadvantaged 4th grade students fared even worse, ranking 45th in the nation in mathematics.

Furthermore, Michigan's performance trend on the 4th grade mathematics NAEP assessment over the last decade is persistently low, with only 35%, 34%, and 36% of all students at or above proficiency in 2009, 2015, and 2019, respectively. State level data are no more encouraging.

Nearly 60% of Michigan 4th Graders are not proficient on M-STEP

State testing also reveals a disheartening performance trend in mathematics over the last five years of 4th grade M-STEP assessments.

- Only 42% of Michigan students were proficient or advanced on the 2019 4th grade M-STEP mathematics assessment.
- Conversely, this means that nearly 60% of Michigan 4th Grade students are not proficient in mathematics.

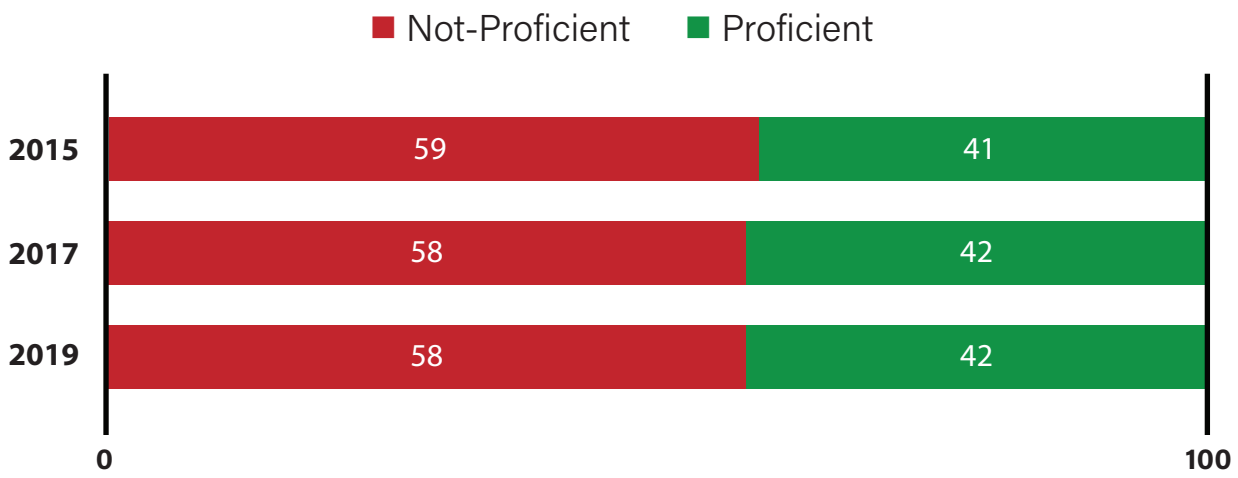
Similar to the NAEP 4th grade mathematics assessment, the performance trend for Michigan students on the 4th grade M-STEP mathematics assessment is persistently low, with only 41%, 42%, and 42% of all students at or above proficiency in 2015, 2017, and 2019, respectively.

Poor Achievement In Mathematics Has Lasting Results

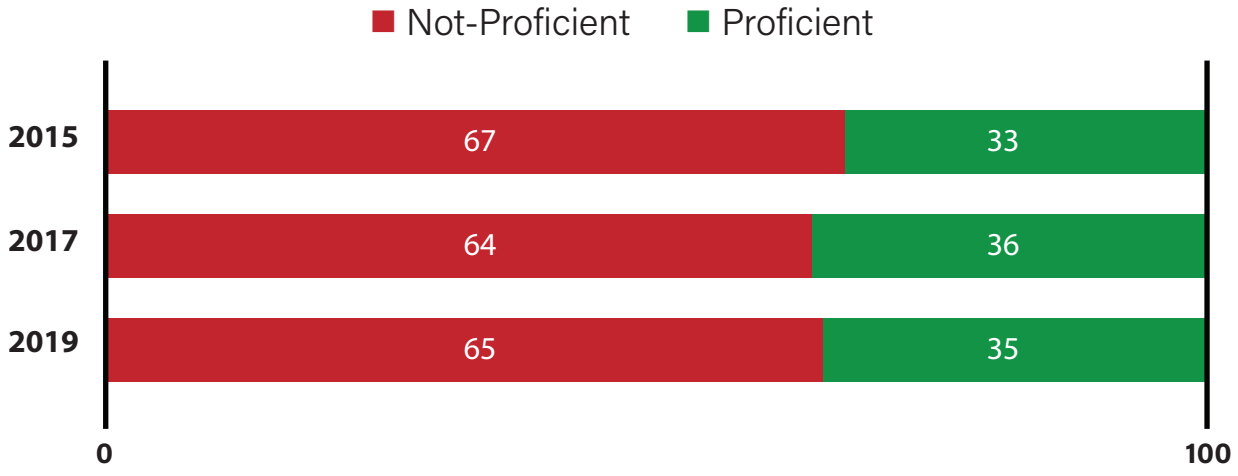
Finally, the performances of Michigan students on the 4th grade NAEP and 4th grade M-STEP are reflected in the performance of Michigan students on the SAT. Less than 37% of all Michigan students met the benchmark on the mathematics portion of the SAT in 2019, with a four-year average of 36.7%. Conversely, this means that 63% of Michigan juniors did not meet the standard for college readiness defined by the College Board.

This data tells a story with one necessary ending: **something must change — and soon.**

Michigan 4th Grade M-STEP Proficiency Rates



Michigan 4th Grade NAEP Proficiency Rates



Laying the Groundwork for Change:

While Michigan has instituted various new state-wide initiatives such as new academic standards, educator evaluation systems, student assessments, and school report cards, mathematics achievement remains persistently low over state and national testing cycles (as seen above). This implies that these large scale changes to policy and standards are insufficient to result in the changes we desire. Due to the cumulative nature of mathematics learning and our lack of progress in achievement, improving learning in early mathematics has never been more crucial.

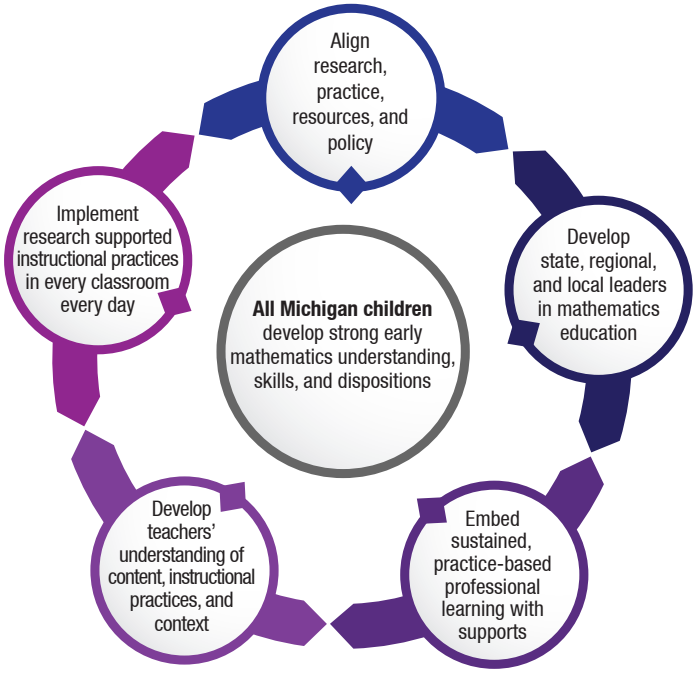
The reality is that students who do well in early mathematics have greater success in mathematics later in school (Aubry, Godfrey, & Dahl, 2006; Claessens & Engel, 2013), in school more broadly, and later in the labor market. Furthermore, high-quality early mathematics instruction narrows achievement gaps between marginalized and majority groups (Silver & Stein, 1996).

Lastly, early mathematics development serves as a better predictor of later success than even early literacy (Nguyen et al., 2017; Watts et al., 2014). Therefore, it is imperative that special attention be paid to children's mathematical development from prekindergarten through 3rd grade. This is best done by supporting teachers as they institute research-informed best practices in the classroom.

The Journey to Excellence

How do we get there? These steps set the stage for a new vision of early mathematics where the Essential Instructional Practices in Early Mathematics: Prekindergarten to Grade 3 prompt shifts in systems, teaching, learning, and assessment so that every child develops strong early mathematical understanding, skills, and dispositions. Realizing this vision requires an expansive, state-wide theory of action that aligns policy, resources, and practice with research. It requires an extensive scope of work that considers the school-based factor that has the largest influence over student performance: the amount, kind, and quality of mathematics instruction that students receive — a factor that raises the achievement of all students and begins to close Michigan's achievement gaps. It requires robust leadership that is skilled, adaptive at creating systems and supports for learners, and committed long term to ensuring that every child in prekindergarten to grade 3 receives research-supported mathematics instruction every day, regardless of zip code.

Early Mathematics Theory of Action



Establishing the Focus

The MAISA GELN Early Math Task Force *Essential Instructional Practices in Early Mathematics: Prekindergarten to Grade 3* are a small set of research-supported practices that provide a focus for district-wide continuous improvement efforts, teacher professional learning including coaching, and the development of systems to support mathematics education in Michigan. These eight practices have significant potential to positively impact children's learning of mathematics and will set our state on a path to make a measurable positive difference in mathematics achievement in Michigan.

The GELN Early Math Task Force plan for a research-supported early mathematics professional learning system begins with building a state-wide infrastructure of professional learning networks (PLNs) to build capacity, skills, and expertise for school leaders, professional developers, early mathematics coaches, and teachers. Our PLNs will, over time, raise Michigan's capacity to support teachers with high-quality early math professional learning and shoulder-to-shoulder instructional coaching.

A commitment to this approach leads to high-quality instructional practices in every classroom, furthering the development of each student's mathematics knowledge, skills, and dispositions necessary to improve mathematics achievement. This approach promotes equitable, accessible mathematics learning for the children of Michigan.

Vision Statements

IF all stakeholders are committed to engaging in a strong mathematics instruction model…

- All prekindergarten to 3rd grade educators are implementing the *Essential Instructional Practices in Early Mathematics: Prekindergarten to Grade 3*.
- All prekindergarten to 3rd grade teachers in Michigan have access to a highly trained and qualified early math coach and other professional developers.
- All pre-service teachers enter the profession with skills and dispositions to support all learners.
- All early mathematics coaches in Michigan are supported with a robust coaches' network and professional learning opportunities.
- All early mathematics coaches have opportunities to receive coaching certification.
- Research continues to drive the vision and work.
- Strong mathematics leadership and school-level support are available, including:
  - all building principals and early childhood directors have been trained in the *Essential School-Wide and Center-Wide Practices*;
  - all school leaders (ISDs, early and elementary, higher ed) are collectively focused on Michigan's vision for all children to be proficient in mathematics and to develop positive mathematical identities;
  - a robust early mathematics system connects early learning with grades K to 3;
  - all educational groups work together in a unified way to meet the needs of Michigan's children; and
  - the *Essential Instructional Practices in Early Mathematics* are used with a high degree of fidelity every day in every classroom, with every child.

THEN…

- Every child makes at least one year of growth in their mathematics skills each year, producing highly mathematics-proficient high school graduates.
- More children enter the 4th grade prepared for success in mathematics and in school more broadly.
- All children perform at grade level in mathematics after attending any Michigan school for multiple years.
- Michigan youth have highly developed mathematical competencies and identities, are more successful in high school and college math courses, and are more likely to become fully employed in higher-wage occupations.

References

Aubrey, C., Godfrey, R., & Dahl, S. (2006). Early mathematics development and later achievement: Further evidence. *Mathematics Education Research Journal, 18*(1), 27-46.

Claessens, A. & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record, 115*(6).

Nguyen, T., Watts, T. W., Duncan, G. J., Clements, D. H., Sarama, J. S., Wolfe, C., & Spitler, M. E. (2016). Which preschool mathematics competencies are most predictive of fifth grade achievement? *Early Childhood Research Quarterly, 36*(3), 550-560. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4819335/

Silver, E. A. & Stein, M. K. (1996). The "revolution of the possible" in mathematics instructional reform in urban middle schools. *Urban Education, 30*(4), 476-521.

Watts, T. W., Duncan, G. J., Siegler, R. S., & Davis-Kean, P. E. (2014). What's past is prologue: Relations between early mathematics knowledge and high school achievement. *Educational Researcher, 43*(7), 352-360. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4719158/

Process for Development and Review

This document was developed by the MAISA Mathematics Task Force, a subcommittee of the Michigan Association of Intermediate School Administrators (MAISA) General Education Leadership Network (GELN), which represents Michigan's 56 Intermediate School Districts. The Task Force included representatives from the following organizations.

Allegan Area Educational Service Agency
Alt+Shift
Bay-Arenac Intermediate School District
Calhoun Intermediate School District
Eaton Regional Educational Service Agency
Grand Valley State University
Gratiot-Isabella Regional Educational Service District
Ingham Intermediate School District
Iosco Regional Educational Service Agency
Kalamazoo Regional Educational Service Agency
Kent Intermediate School District
MAISA Early Childhood Administrators Network
MAISA Mathematics Leadership Team
Michigan Assessment Consortium
Michigan Association of Mathematics Teacher Educators
Michigan Association of Superintendents & Administrators
Michigan Council of Teachers of Mathematics
Michigan Department of Education
Michigan Mathematics and Science Leaders Network
Michigan State University
Maco
Mecosta Osceola Intermediate School District
MiSTEM Network
Monroe County Intermediate School District
Montcalm Area Intermediate School District
Muskegon Area Intermediate School District
Oakland Schools
Saginaw Intermediate School District
Shiawassee Regional Educational Service District
University of Michigan
Washtenaw Intermediate School District
Wayne Regional Educational Service Agency

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MICHIGAN ASSOCIATION OF INTERMEDIATE SCHOOL ADMINISTRATORS
SUPPORTING REGIONAL EDUCATION SERVICE AGENCIES