National Council on Teacher Quality

Solving for success: How to improve math instruction in Ohio

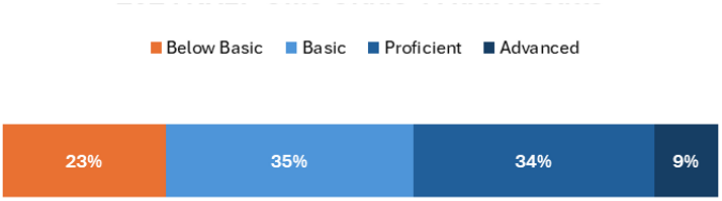
Math matters. Higher math scores for elementary-age students translate to higher earnings as adults.[1] In fact, math scores predict future earnings better than reading scores. Early math skills are also a strong predictor of success in other subjects, like reading and science, and even predict grade retention from kindergarten through eighth grade.[2] Math skills are in high demand in the labor market. Among the fastest growing jobs are those that require quantitative skills.[3] Despite this evidence for how much math matters, state policy and support for strengthening math instruction severely lags nationwide.

To improve math instruction, we must bolster the capacity of **teachers**, especially before they enter classrooms. The solution starts with strong state policy.

The stakes for students in Ohio

In Ohio, 23% of 4th grade lack basic math knowledge and skills based on the most recent National Assessment of Education Progress (NAEP). That percentage is even higher for some of Ohio's historically underserved students. This means an estimated 27,358 students in 4th grade likely cannot perform skills like adding and subtracting multidigit whole numbers, fractions, and decimals.

2024 NAEP Ohio Grade 4 Math Results



Mathematics knowledge is highly cumulative in nature, meaning that students who struggle to learn foundational math concepts are likely to continue to struggle well into middle and high school.[4] **A student who struggles in math early on may never catch up.**

[1] Werner, K., Acs, G., & Blagg, K. (2024). *Comparing the Long-Term Impacts of Different Child Well-Being Improvements.* Urban Institute. https://www.urban.org/sites/default/files/2024-03/Comparing_the_Long-Term_Impacts_of_Different_Child_Well-Being_Improvements.pdf.

[2] Claessens, A., & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record, 115*(6), 1-29.

[3] U.S. Bureau of Labor Statistics. (2024, August). Math occupations. *Occupational Outlook Handbook.* https://www.bls.gov/ooh/math/

[4] Watts, T. W., Duncan, G. J., Siegler, R. S., & Davis-Kean, P. E. (2014). The groove of growth: How early gains in math ability influence adolescent achievement. *Society for Research on Educational Effectiveness*; Siegler, R. S., Duncan, G. J., Davis-Kean, P. E., Duckworth, K., Claessens, A., Engel, M., & Chen, M. (2012). Early predictors of high school mathematics achievement. *Psychological Science, 23*(7), 691-697

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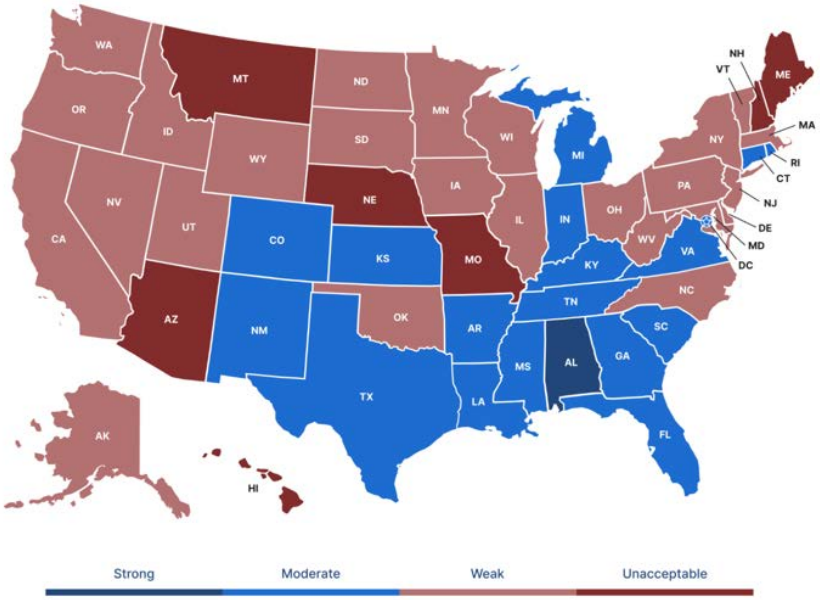
Ohio's performance on state policies to improve math instruction

NCTQ's *State of the States: Five Policy Levers to Improve Math Instruction* report provides a framework of actions state policymakers can take to ensure their teacher workforce can implement rigorous standards-aligned math instruction. States fall into one of four categories based on how extensively they have utilized five key policy levers at every stage of a teacher's career—from preparation to the classroom. Ohio earned a **Weak rating**, meaning the state has a few policies in place across the five policy levers, but there is more to do.

Ohio Rating:

Weak



Policy actions are weighted equally. The chart below shows how Ohio performs across the five policy levers.

How is Ohio performing on the five state policy levers?

Ohio ranks **below** the national average.

1	Sets specific, detailed math standards for teacher preparation programs	**Unacceptable**
2	Reviews teacher preparation programs to ensure they are providing strong math instruction	**Strong**
3	Adopts a strong elementary math licensure test	**Moderate**
4	Requires districts to select high-quality math curricula and supports skillful implementation	**Unacceptable**
5	Provides professional learning and ongoing support for teachers to sustain effective math instruction	**Unacceptable**

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How does Ohio perform on each of the actions?

To determine the ratings above, NCTQ identified 16 key actions within the five policy levers and analyzed the extent to which states are implementing them. The actions represent policies and practices states should employ to support the implementation of rigorous, high-quality math instruction across the teacher development continuum. This chart outlines Ohio's performance across all actions.

✔ Yes ○ Partially ✖ No

Teacher prep standards	Does the state have math standards for elementary teacher prep programs that cover all four key math content topics (numbers & operations, algebraic thinking, geometry & measurement, data analysis & probability)?	○
	Does the state require elementary programs to address math-specific pedagogy?	✖
Prep program approval	Does the state require the review of syllabi and/or coursework for math courses to determine the integration of math standards as part of the program review process?	✔
	Does the state require the inclusion of math experts in the review of teacher prep programs?	✔
	Does the state use math licensure test pass rate data as part of the program review process?	✔
	Does the state maintain full authority over prep program reviews and not permit outside entities to make the final decision on program renewal?	✔
Licensure test	Does the state use at least an acceptable math licensure test for elementary teacher candidates?	✖
	Does the state require all elementary candidates to pass a math licensure test?	✔
	Does the state publish math licensure pass rate data?	✔

✔ Yes ○ Partially ✖ No

High-quality curriculum	Does the state require districts to adopt and implement high-quality math curricula?	✖
	Does the state provide guidance on how to select high-quality math curricula?	✔
	Does the state collect and publish data on the curricula districts are using?	✖
	Does the state require districts to post their math curricula on their websites?	✖
	Does the state allocate resources to help districts transition to and implement new curricula?	✖
Professional learning & coaching	Does the state financially support high-quality professional learning in mathematics instruction, especially in implementation of high-quality instructional materials?	✖
	Does the state provide financial support to districts for math coaches/specialists?	✖

Recommendations for Ohio

Teacher prep standards:

- While the state provides a list of key topics, standards should clearly define, in detail, what preparation programs should teach in the four core math content areas.
- Require elementary teacher prep programs to address math-specific pedagogy to ensure that aspiring teachers learn how to translate their content expertise into effective instruction.
- Encourage elementary teacher preparation programs to prioritize math courses designed for educators over traditional higher-level math requirements.

Licensure tests:

- Revise the current test or select a new test that adequately covers all four content topics and is rated at least acceptable.

High-quality curricula:

- Require districts to adopt and implement high-quality math instructional materials.
- Collect and publish data on the curricula districts are using.
- Enact a policy that requires districts to publish the math curricula they are using to ensure transparency for parents and the school community.
- Allocate funds to help districts transition to and implement better curricula.

Professional learning & coaching

- Ensure all elementary teachers have access to high-quality professional learning in math instruction, aligned with the use of high-quality instructional materials.
- Provide districts with funds to support math coaches/specialists to improve instruction, and consider how the state can provide training and ongoing support for coaches to promote consistency in math instruction statewide.
- Conduct robust ongoing evaluation of professional learning.

The current teacher prep landscape in Ohio

Elementary math teacher prep

Far too many elementary teacher prep programs fail to dedicate enough instructional time to building aspiring teachers' math knowledge—leaving teachers unprepared and students underserved. Put simply, teachers must deeply understand the math content they want students to learn and must have specialized knowledge about how to teach it (i.e., math pedagogy). This is why strong state policy related to teacher prep is so important.

In Ohio, NCTQ evaluated 42 elementary prep programs to determine whether they dedicate enough time to key math content topics and pedagogy. The analysis shows Ohio programs perform above the national average. (To learn more, see the *2025 Teacher Prep Review: Solving for Math Success* report.)

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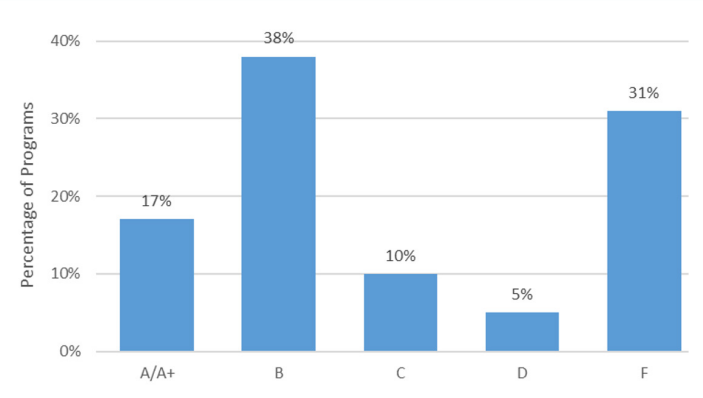
17% of Ohio programs earn an A or A+ by dedicating adequate instructional time to both math content and pedagogy



NCTQ looks for instructional hours dedicated to math pedagogy and four math content topics:

- *Numbers and Operations*
- *Algebraic Thinking*
- *Geometry and Measurement*
- *Data Analysis and Probability*

Grades are determined by the amount and distribution of instructional time

A+ Program requires at least 150 instructional hours across the five topics and 100% of the recommended target hours for each topic

A Program requires at least 135 instructional hours across the five topics and at least 90% of the recommended target hours for each topic

B Program requires at least 120 instructional hours (80%) across the five topics

C Program requires at least 105 instructional hours (70%) across the five topics

D Program requires at least 90 instructional hours (60%) across the five topics

F Program requires fewer than 90 instructional hours (<60%) across the five topics

Teacher Prep Program Grades in Ohio

School	Program Level	Grade	Instructional Hour Targets for Math Content and Pedagogy			
			Numbers & Operations + Algebraic Thinking (combined)	Geometry & Measurement	Data Analysis & Probability	Math Pedagogy
Ashland University	UG	F	Does Not Meet (23 hours)	Does Not Meet (14 hours)	Does Not Meet (9 hours)	Does Not Meet (23 hours)
Ashland University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (23 hours)
Baldwin Wallace University	UG	B	Approaches (60 hours)	Fully Meets (50 hours)	Does Not Meet (10 hours)	Fully Meets (90 hours)

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School	Program Level	Grade	Instructional Hour Targets for Math Content and Pedagogy			
			Numbers & Operations + Algebraic Thinking (combined)	Geometry & Measurement	Data Analysis & Probability	Math Pedagogy
Bluffton University	UG	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (54 hours)
Bowling Green State University	UG	A+	Fully Meets (82 hours)	Fully Meets (40 hours)	Fully Meets (28 hours)	Fully Meets (76 hours)
Capital University	UG	A+	Fully Meets (66 hours)	Fully Meets (38 hours)	Fully Meets (16 hours)	Fully Meets (60 hours)
Cedarville University	UG	CBD	Could not be determined	Could not be determined	Could not be determined	Could not be determined
Central State University	UG	F	Does Not Meet (0 hours)	Fully Meets (45 hours)	Does Not Meet (0 hours)	Fully Meets (90 hours)
Cleveland State University	UG	A	Approaches (60 hours)	Fully Meets (30 hours)	Fully Meets (30 hours)	Fully Meets (45 hours)
Cleveland State University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (68 hours)
Defiance College	UG	D	Does Not Meet (46 hours)	Does Not Meet (17 hours)	Fully Meets (26 hours)	Does Not Meet (15 hours)
Franciscan University of Steubenville	UG	B	Fully Meets (69 hours)	Does Not Meet (4 hours)	Does Not Meet (12 hours)	Fully Meets (45 hours)
John Carroll University	UG	C	Does Not Meet (48 hours)	Does Not Meet (10 hours)	Fully Meets (23 hours)	Fully Meets (51 hours)
Kent State University	UG	A+	Fully Meets (131 hours)	Fully Meets (57 hours)	Fully Meets (21 hours)	Fully Meets (46 hours)
Kent State University	G	D	Does Not Meet (48 hours)	Does Not Meet (20 hours)	Does Not Meet (3 hours)	Does Not Meet (19 hours)
Lake Erie College	UG	B	Does Not Meet (48 hours)	Fully Meets (34 hours)	Does Not Meet (8 hours)	Does Not Meet (39 hours)
Malone University	UG	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (16 hours)	Fully Meets (45 hours)
Marietta College	UG	B	Fully Meets (69 hours)	Fully Meets (42 hours)	Does Not Meet (6 hours)	Fully Meets (48 hours)

Note: Programs that meet or exceed the instructional target earn a "Fully Meets." Programs that provide at least 90% of the instructional target earn an "Approaches. For more information about instructional hour targets, review NCTQ's methodology and scoring rubric here.

School	Program Level	Grade	Instructional Hour Targets for Math Content and Pedagogy			
			Numbers & Operations + Algebraic Thinking (combined)	Geometry & Measurement	Data Analysis & Probability	Math Pedagogy
Miami University of Ohio	UG	B	Approaches (60 hours)	Does Not Meet (20 hours)	Fully Meets (40 hours)	Fully Meets (54 hours)
Mount St. Joseph University	UG	B	Approaches (62 hours)	Does Not Meet (15 hours)	Does Not Meet (9 hours)	Fully Meets (65 hours)
Mount Vernon Nazarene University	UG	F	Does Not Meet (34 hours)	Does Not Meet (7 hours)	Does Not Meet (3 hours)	Does Not Meet (30 hours)
Muskingum University	UG	F	Does Not Meet (12 hours)	Does Not Meet (13 hours)	Fully Meets (19 hours)	Fully Meets (45 hours)
Ohio Dominican University	UG	B	Fully Meets (86 hours)	Fully Meets (26 hours)	Does Not Meet (9 hours)	Fully Meets (45 hours)
Ohio State University	UG	B	Fully Meets (83 hours)	Fully Meets (61 hours)	Does Not Meet (6 hours)	Fully Meets (45 hours)
Ohio State University	G	B	Fully Meets (83 hours)	Fully Meets (61 hours)	Does Not Meet (6 hours)	Fully Meets (45 hours)
Ohio University	UG	B	Does Not Meet (47 hours)	Does Not Meet (16 hours)	Fully Meets (18 hours)	Fully Meets (53 hours)
Otterbein University	UG	F	Does Not Meet (16 hours)	Fully Meets (38 hours)	Fully Meets (26 hours)	Does Not Meet (11 hours)
Shawnee State University	UG	B	Does Not Meet (47 hours)	Fully Meets (34 hours)	Does Not Meet (9 hours)	Fully Meets (60 hours)
University of Akron	UG	B	Fully Meets (74 hours)	Does Not Meet (21 hours)	Does Not Meet (9 hours)	Does Not Meet (32 hours)
University of Cincinnati	UG	C	Approaches (60 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (98 hours)
University of Dayton	UG	A+	Fully Meets (82 hours)	Fully Meets (36 hours)	Fully Meets (18 hours)	Fully Meets (45 hours)
University of Findlay	UG	C	Approaches (63 hours)	Does Not Meet (7 hours)	Does Not Meet (4 hours)	Does Not Meet (40 hours)
University of Mount Union	UG	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)
University of Rio Grande	UG	C	Fully Meets (75 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (75 hours)
University of Toledo	UG	B	Fully Meets (73 hours)	Does Not Meet (21 hours)	Fully Meets (16 hours)	Does Not Meet (26 hours)

School	Program Level	Grade	Instructional Hour Targets for Math Content and Pedagogy			
			Numbers & Operations + Algebraic Thinking (combined)	Geometry & Measurement	Data Analysis & Probability	Math Pedagogy
University of Toledo	G	F	Does Not Meet (16 hours)	Does Not Meet (3 hours)	Does Not Meet (0 hours)	Does Not Meet (26 hours)
Walsh University	UG	F	Does Not Meet (29 hours)	Does Not Meet (6 hours)	Does Not Meet (6 hours)	Does Not Meet (26 hours)
Wilmington College	UG	A	Approaches (60 hours)	Fully Meets (45 hours)	Fully Meets (15 hours)	Fully Meets (60 hours)
Wittenberg University	UG	B	Does Not Meet (50 hours)	Fully Meets (60 hours)	Does Not Meet (10 hours)	Fully Meets (60 hours)
Wright State University	UG	A+	Fully Meets (67 hours)	Fully Meets (37 hours)	Fully Meets (16 hours)	Fully Meets (45 hours)
Xavier University	UG	B	Fully Meets (69 hours)	Fully Meets (43 hours)	Does Not Meet (3 hours)	Approaches (42 hours)
Xavier University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (56 hours)
Youngstown State University	UG	B	Fully Meets (86 hours)	Does Not Meet (17 hours)	Fully Meets (17 hours)	Fully Meets (60 hours)

Questions? Contact Shannon Holston, Chief of Policy at sholston@nctq.org or Ron Noble, Chief of Teacher Prep at ron.noble@nctq.org.