National Council on Teacher Quality

Solving for success: How to improve math instruction in Tennessee

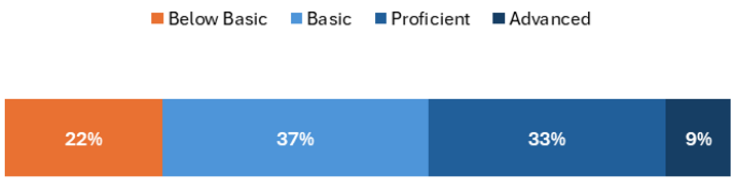
Math matters. Higher math scores for elementary-age students translate to higher earnings as adults.[1] In fact, math scores predict future earnings better than reading scores. Early math skills are also a strong predictor of success in other subjects, like reading and science, and even predict grade 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 Tennessee

In Tennessee, 22% of 4th graders 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 Tennessee's historically underserved students. This means an estimated 16,301 students in 4th grade likely cannot perform skills like adding and subtracting multidigit whole numbers, fractions, and decimals.

2024 NAEP Tennessee 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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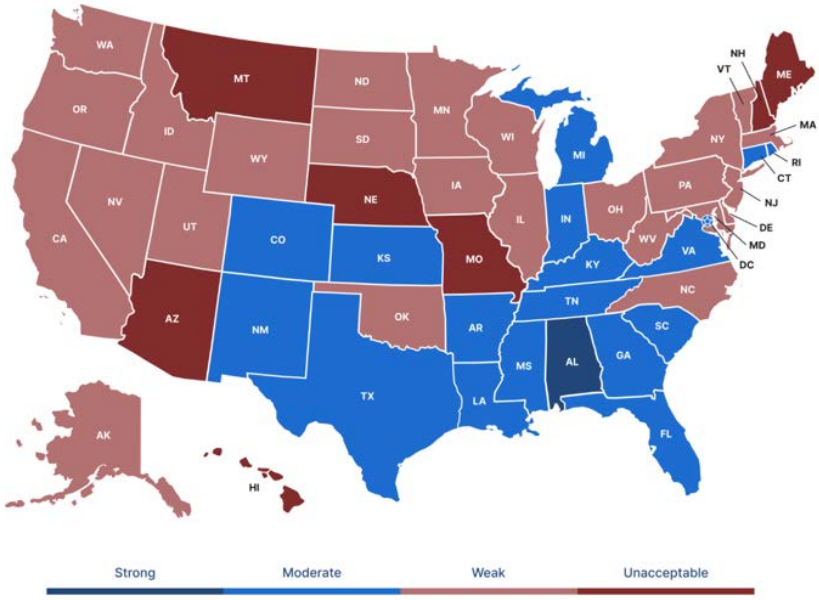
Tennessee's performance on state policies to improve math instruction

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. Tennessee earned a **Moderate rating**, meaning the state has some policies in place across the five policy levers, but there is more to do.

Tennessee Rating:

Moderate



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

How is Tennessee performing on the five state policy levers?

Tennessee ranks **slightly above** the national average.

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

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How does Tennessee 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 Tennessee'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 Tennessee

Teacher prep standards:

- 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.

Prep program approval:

- Review syllabi and/or coursework as part of the program review process to assess whether programs properly address math content standards and pedagogy as part of aspiring teachers' preparation.
- Include math experts as program reviewers, including for on-site reviews.

- Use math licensure test pass rate data to assess whether prep programs are sufficiently preparing aspiring teachers in mathematics content.

Licensure tests:

- Publish first-time pass rate data by program on the math licensure test to determine which programs are preparing candidates well.

High-quality curricula:

- Collect and publish data on the curricula districts are using.

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 Tennessee

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 Tennessee, NCTQ evaluated 41 elementary prep programs to determine whether they dedicate enough time to key math content topics and pedagogy. The analysis shows Tennessee programs perform below the national average. (To learn more, see the *2025 Teacher Prep Review: Solving for Math Success* report.)

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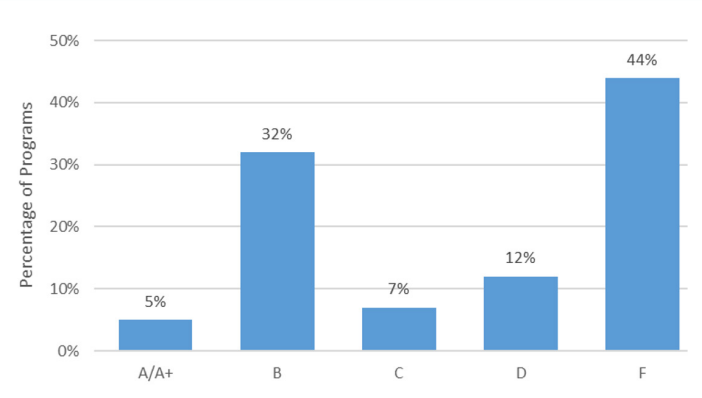
Only 5% of Tennessee programs earn an A or A+ by dedicating adequate instructional time to both math content and pedagogy



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 Tennessee

School	Program Level	Grade	Instructional Hour Targets for Math Content and Pedagogy			
			Numbers & Operations + Algebraic Thinking (combined)	Geometry & Measurement	Data Analysis & Probability	Math Pedagogy
Austin Peay State University	UG	C	Does Not Meet (45 hours)	Does Not Meet (0 hours)	Fully Meets (45 hours)	Fully Meets (90 hours)
Austin Peay State University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (45 hours)
Belmont University	UG	B	Does Not Meet (45 hours)	Approaches (23 hours)	Fully Meets (23 hours)	Fully Meets (45 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
Carson-Newman University	UG	B	Approaches (61 hours)	Does Not Meet (8 hours)	Fully Meets (15 hours)	Fully Meets (45 hours)
Carson-Newman University	G	B	Does Not Meet (52 hours)	Does Not Meet (20 hours)	Does Not Meet (12 hours)	Fully Meets (45 hours)
Cumberland University	UG	F	Does Not Meet (22 hours)	Does Not Meet (11 hours)	Does Not Meet (0 hours)	Does Not Meet (11 hours)
Cumberland University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (45 hours)
East Tennessee State University	UG	B	Does Not Meet (45 hours)	Fully Meets (30 hours)	Fully Meets (15 hours)	Fully Meets (102 hours)
Freed-Hardeman University	UG	F	Does Not Meet (25 hours)	Does Not Meet (15 hours)	Does Not Meet (0 hours)	Fully Meets (45 hours)
Freed-Hardeman University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (45 hours)
King University	UG	C	Does Not Meet (30 hours)	Does Not Meet (15 hours)	Fully Meets (35 hours)	Fully Meets (45 hours)
King University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)
Lee University	UG	D	Does Not Meet (46 hours)	Does Not Meet (19 hours)	Fully Meets (26 hours)	Does Not Meet (11 hours)
Lincoln Memorial University	UG	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (54 hours)
Lincoln Memorial University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (45 hours)
Lipscomb University	UG	A	Approaches (62 hours)	Fully Meets (51 hours)	Fully Meets (17 hours)	Approaches (41 hours)
Lipscomb University	G	B	Fully Meets (65 hours)	Fully Meets (25 hours)	Approaches (14 hours)	Does Not Meet (26 hours)
Middle Tennessee State University	UG	B	Does Not Meet (55 hours)	Fully Meets (48 hours)	Does Not Meet (1 hours)	Fully Meets (51 hours)
Middle Tennessee State University	G	F	Does Not Meet (14 hours)	Does Not Meet (4 hours)	Does Not Meet (1 hours)	Does Not Meet (38 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
Milligan University	UG	D	Does Not Meet (46 hours)	Does Not Meet (13 hours)	Does Not Meet (11 hours)	Does Not Meet (31 hours)
Milligan University	G	D	Does Not Meet (46 hours)	Does Not Meet (13 hours)	Does Not Meet (11 hours)	Does Not Meet (31 hours)
South College	UG	CBD	Could not be determined	Could not be determined	Could not be determined	Could not be determined
Southern Adventist University	UG	F	Does Not Meet (17 hours)	Does Not Meet (6 hours)	Does Not Meet (12 hours)	Fully Meets (68 hours)
Tennessee State University	UG	B	Fully Meets (75 hours)	Does Not Meet (11 hours)	Does Not Meet (4 hours)	Fully Meets (45 hours)
Tennessee State University	G	F	Does Not Meet (20 hours)	Does Not Meet (1 hours)	Does Not Meet (1 hours)	Does Not Meet (23 hours)
Tennessee Technological University	UG	B	Does Not Meet (54 hours)	Does Not Meet (21 hours)	Fully Meets (15 hours)	Fully Meets (90 hours)
Tennessee Technological University	G	F	Does Not Meet (14 hours)	Does Not Meet (7 hours)	Does Not Meet (0 hours)	Does Not Meet (24 hours)
Tennessee Wesleyan University	UG	B	Does Not Meet (45 hours)	Fully Meets (27 hours)	Fully Meets (35 hours)	Fully Meets (45 hours)
Tennessee Wesleyan University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (30 hours)
Trevecca Nazarene University	UG	CBD	Could not be determined	Could not be determined	Could not be determined	Could not be determined
Trevecca Nazarene University	G	A	Approaches (61 hours)	Approaches (23 hours)	Fully Meets (15 hours)	Fully Meets (45 hours)
Tusculum University	UG	C	Does Not Meet (58 hours)	Fully Meets (45 hours)	Does Not Meet (0 hours)	Does Not Meet (32 hours)
Tusculum University	G	F	Does Not Meet (13 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (32 hours)
Union University	UG	F	Does Not Meet (22 hours)	Does Not Meet (0 hours)	Fully Meets (28 hours)	Does Not Meet (38 hours)
Union University	G	B	Approaches (64 hours)	Approaches (23 hours)	Does Not Meet (12 hours)	Does Not Meet (35 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
University of Memphis	UG	B	Fully Meets (67 hours)	Does Not Meet (14 hours)	Does Not Meet (9 hours)	Fully Meets (45 hours)
University of Memphis	G	B	Does Not Meet (52 hours)	Does Not Meet (20 hours)	Does Not Meet (12 hours)	Fully Meets (45 hours)
University of Tennessee	UG	D	Does Not Meet (35 hours)	Does Not Meet (18 hours)	Does Not Meet (6 hours)	Does Not Meet (34 hours)
University of Tennessee at Chattanooga	UG	D	Does Not Meet (12 hours)	Fully Meets (25 hours)	Fully Meets (15 hours)	Does Not Meet (39 hours)
University of Tennessee at Chattanooga	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (11 hours)
University of Tennessee at Martin	UG	B	Does Not Meet (54 hours)	Fully Meets (27 hours)	Does Not Meet (9 hours)	Fully Meets (45 hours)
University of Tennessee at Martin	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)
Vanderbilt University	UG	CBD	Could not be determined	Could not be determined	Could not be determined	Could not be determined
Vanderbilt University	G	F	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Does Not Meet (0 hours)	Fully Meets (50 hours)

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