About Editorial Projects in Education

Editorial Projects in Education (EPE) is a nonprofit, tax-exempt organization based in Bethesda, Md. Its primary mission is to help raise the level of awareness and understanding among professionals and the public of important issues in American education. EPE covers local, state, national, and international news, and issues from preschool through the 12th grade. Editorial Projects in Education publishes Education Week, America’s newspaper of record for precollegiate education, the online Teacher, EdWeek Market Brief, and the Top School Jobs employment resource. It also produces periodic special reports on issues ranging from technology to textbooks, as well as books of special interest to educators.

The EdWeek Research Center conducts surveys, collects data, and performs analyses that appear in Education Week and EdWeek Market Brief. The center also conducts independent research studies for external clients including for-profit and nonprofit organizations.

About the Bill & Melinda Gates Foundation

Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to help all people lead healthy, productive lives. Its commitment to education centers on working to ensure all students graduate high school prepared to succeed in college and careers.
Executive Summary

When compared to pre-pandemic scores, results from the 2022 National Assessment of Educational Progress showed the most substantial declines in 4th and 8th grade math achievement on record. More than one-quarter of 4th graders scored below the basic level of achievement. Roughly 4 in 10 8th grade students scored below the basic achievement level. Those findings are among a cascade of data points indicating the critical need to improve student learning in math.

Instructional practices are one of many factors that can influence math achievement. Those instructional practices are often shaped by the training teachers received in postsecondary teacher preparation programs. With the connections between teacher practice and teacher preparation in mind, the EdWeek Research Center surveyed postsecondary instructors charged with preparing prospective teachers for the classroom in order to learn more about how they see math instruction and to compare their views to the perspectives that current K-12 math teachers shared in an earlier survey.

A better understanding of any gaps between teacher training and teacher practice can help to ensure K-12 teachers are better prepared for their roles and improve opportunities for K-12 students to learn the math skills they need to be college and career ready.

Key survey findings include:

- When asked about student learning, 37 percent of K-12 math teachers said that most of their students are falling behind in math.
- Fifty-two percent of postsecondary math or math education teachers believed that the K-12 education system prepared the students they teach somewhat or very poorly for postsecondary math courses.
- When asked about the importance of K-12 students’ fluency in math facts—such as single-digit addition, multiplication, and times-tables—the perspectives of postsecondary and K-12 educators differed. Fifty-six percent of respondents to the postsecondary survey thought it’s essential for K-12 students to be fluent in math facts in order to tackle higher-order or more conceptual problems, compared to 72 percent of K-12 math teachers.

Introduction

To learn more about similarities and differences in the views of current K-12 math teachers and the postsecondary instructors who will train future teachers, the EdWeek Research Center carried out two comprehensive surveys between March 26 and July 30, 2023. Nearly 700 educators from both the K-12 and postsecondary sectors participated.

In March 2023, the Center surveyed current K-12 math teachers. Then, in June, the Center fielded a survey to postsecondary educators who taught math education courses intended for teacher preparation and instructors teaching math courses in which at least some students were enrolled in teacher preparation programs.

Results showed areas of consensus between K-12 and postsecondary educators but also highlighted gaps in their views. By shedding light on the differences between K-12 teachers and the postsecondary educators tasked with preparing the next generation of teachers, there is an opportunity to improve understanding of the best ways to improve math instruction and student achievement in this critical academic subject.
SURVEY DETAILS

Surveys Administered: K-12—March 26th to April 16th, 2023; Postsecondary—June 27th to July 30th, 2023

Samples: Nationally representative

Method: Online [Email invitations sent to online surveys]

Respondents: 673 educators participated in these surveys, with 301 from the K-12 sector and 372 from the postsecondary sector.

Demographics

The surveys drew responses from a diverse range of educators who teach math in K-12 schools and math or math education courses in postsecondary institutions across the nation.

Region

K-12 respondents most commonly hailed from the South (34 percent). Twenty-eight percent worked in the West with 23 percent serving in the Midwest and 15 percent in the Northeast.

Thirty percent of postsecondary respondents worked in the South while 26 percent were from the Midwest and 24 percent from the Northeast. Two in 10 respondents hailed from the West.

District Poverty

Thirty-five percent of respondents to the K-12 survey reported that half of the students in their districts or less qualified for free or reduced-price meals, a proxy for family poverty. Most respondents (65 percent) indicated that the majority of students in their districts qualified.

Type of Postsecondary Institution

The majority of postsecondary respondents (53 percent) worked at a public institution. One-fifth worked in a school where a PhD or EdD is the highest degree offered. Roughly one-quarter (26 percent) worked at a public institution where a master’s is the most advanced degree offered. Seven percent served in public institutions granting bachelor’s degrees.

The remaining respondents were employed in a variety of private institutions including for-profit and non-profit schools where the highest degrees offered ranged from a bachelor’s to a PhD or EdD.

Locale

Forty percent of K-12 respondents reported that their schools are in suburban districts with 33 percent in rural areas or towns and 27 percent in urban school systems.

K-12 Teaching Assignment

Educators qualifying for the K-12 survey indicated they spent either some or all of their time at work teaching math. They are referred to as math teachers throughout this report. Thirty-nine percent of K-12 respondents worked in elementary education where they taught all or most academic subjects. Another 36 percent taught math and 12 percent worked in special education. Six percent taught in other roles. Three percent were science
teachers. The remainder taught in career-technical education (2 percent), bilingual education/English as a second language (2 percent), or computer science/data science (<1 percent).

Twenty-one percent of survey respondents served grades K-2. Thirty-four percent taught grades 3-5. Twenty-one percent worked in grades 6-8. One-quarter taught grades 9-12.

Postsecondary Teaching Roles and Experience

Roughly one-third of respondents to the postsecondary survey (34 percent) taught math courses where at least some students were enrolled in teacher preparation programs but not math education courses specifically focused on teacher preparation.

Thirty-eight percent taught only math education courses intended to prepare prospective teachers. More than one-quarter (28 percent) taught both math and math education courses.

Two-thirds of postsecondary respondents (66 percent were tenured or on the tenure-track while 34 percent were non-tenured.

Eighteen percent of postsecondary respondents had taught for five years or less. The majority (51 percent) have 6 to 20 years of experience. Thirty-two percent had more than 20 years of experience.

Most postsecondary survey respondents had also taught in K-12 schools at some point in their careers. One-quarter had taught in K-12 schools for five years or less. Thirty-two percent had between 6 to 20 years of K-12 experience. Nearly one-fifth (18 percent) had served as K-12 teachers for more than 20 years. One-quarter said they had never taught in a K-12 setting.

In which state is your district located?

- Midwest: 28%
- Northeast: 23%
- South: 15%
- West: 34%

*Results show responses from K-12 teachers who teach math some or all of the time.
**Where do you teach?**

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.*

**Which of the following best describes your school’s percentage of students who qualify for free or reduced-price meals?**

*Results show responses from K-12 teachers who teach math some or all of the time.*
Which of the following best describes the institution(s) where you currently teach? Select all that apply.

- Public institution where the most advanced degree offered is a master's degree: 26%
- Public institution where the most advanced degree is a PhD or EdD: 20%
- Private, non-profit institution where the most advanced degree offered is a master's degree: 17%
- Private, non-profit institution where the most advanced degree offered is a PhD or EdD: 15%
- Private, non-profit institution where the most advanced degree offered is a bachelor's degree: 9%
- Public institution where the most advanced degree offered is a bachelor's degree: 7%
- Private, for-profit institution where the most advanced degree offered is a master's degree: 4%
- Private, for-profit institution where the most advanced degree offered is a PhD or EdD: 3%
- Private, for-profit institution where the most advanced degree offered is a bachelor's degree: 2%
- None of these: 1%

Which of the following best describes your district’s location?

- Urban: 40%
- Rural or town: 33%
- Suburban: 27%

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.*

*Results show responses from K-12 teachers who teach math some or all of the time.*
Which of the following COMES CLOSEST to describing your current teaching field?

- Elementary education, all/most subjects: 39%
- Math: 36%
- Special education: 12%
- Other, please specify: 6%
- Science: 3%
- Career-technical education: 2%
- Bilingual education/English as a second language: 2%
- Computer science/data science: 0%

*Results show responses from K-12 teachers who teach math some or all of the time.

Which of the following BEST describes your current professional status?

- Tenured (Tenured faculty, Tenure-track faculty): 66%
- Non-Tenured (Non-tenured, full-time instructor, Adjunct/part-time faculty, Graduate student): 34%

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.
Which grade levels do you primarily teach?

- Grades Pre-K-2: 21%
- Grades 3-5: 34%
- Grades 6-8: 21%
- Grades 9-12: 25%

*Results show responses from K-12 teachers who teach math some or all of the time.

How long have you taught in higher education?

- Highly experienced (>20 years): 32%
- Moderately experienced (6-20 years): 51%
- Less experienced (<=5 years): 18%

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.
What do you currently teach in higher education?

- Teaches MATH EDUCATION ONLY where students aim to teach at K-12 levels: 38%
- Teaches MATH ONLY: 34%
- Teaches MATH EDUCATION & MATH where students aim to teach K-12 levels: 28%

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

How long have you taught/did you teach in K-12 education?

- Highly experienced in K-12 (>20 years): 18%
- Moderately experienced in K-12 (6-20 years): 32%
- Less experienced in K-12 (<=5 years): 25%

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs. Twenty-five percent have never taught in K-12 education.

Math Education: Perceptions and Beliefs

The survey results shed light on the approaches that postsecondary educators who taught math education said they help their students learn as they prepare for future careers in K-12 education as well as their beliefs about K-12 math instruction. There’s broad consensus in many areas but views on some teaching strategies seem influenced by the length of respondents’ teaching careers and their specific teaching roles.
To what extent—if any—do you help students learn to implement these approaches in the K-12 classroom?

Most postsecondary math educators helped prospective teachers learn to connect new math content to their students’ prior knowledge. Fifty-seven percent said they helped students learn to do so through both extensive class discussion and student practice—with feedback. Nineteen percent discussed it extensively in class and practiced the skill at least once but without feedback.

A strong majority of math educators indicated they taught future teachers to identify and respond to their students’ math misconceptions. Half of the educators addressed this skill through extensive class discussions combined with student practice and feedback. Another 20 percent engaged in such discussions and allowed students to practice at least once without feedback.

Math educators are less likely to emphasize training to help teaching candidates learn to connect math content to students’ cultural or personal experiences. Only 36 percent of educators provided extended discussions on this topic coupled with practice and feedback while thirteen percent combined discussion with at least one student practice session without feedback.

The survey data suggest that math educators with 20 or more years in higher education did not emphasize the integration of personal or cultural experiences into math instruction as much as those with less experience in the field. Just 17 percent of math educators with more than 20 years of experience in postsecondary education said they help future teachers to connect math content to students’ cultural or personal experiences through both extensive class discussion and student practice with feedback. By contrast, 41 percent of math educators with 6-20 years of experience and 38 percent with five years of experience or less do so.
Connecting math content to students’ personal or cultural experiences

<table>
<thead>
<tr>
<th></th>
<th>Did not address at all</th>
<th>Briefly mentioned in class</th>
<th>Discussed extensively in class</th>
<th>Discussed extensively in class/students practiced the skill at least once</th>
<th>Both extensive class discussion and student practice—with feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Experienced in Higher Education (&gt;20 years)</td>
<td>9%</td>
<td>32%</td>
<td>28%</td>
<td>15%</td>
<td>17%</td>
</tr>
<tr>
<td>Moderately Experienced (6-20 years)</td>
<td>13%</td>
<td>31%</td>
<td>11%</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>Less experienced in Higher Education (&lt;=5 years)</td>
<td>19%</td>
<td>25%</td>
<td>17%</td>
<td>38%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19%</td>
<td>28%</td>
<td>13%</td>
<td>36%</td>
<td></td>
</tr>
</tbody>
</table>

*Results show responses from postsecondary instructors who teach math education at least some of the time.

*Percentages do not add up to 100 percent due to rounding.

Core Beliefs About Math Instruction

The survey explored the perspectives of postsecondary educators on how K-12 students should approach math and their perceptions about best practices for fostering an effective learning environment.

Most (82 percent) said that K-12 students learning math should be able to solve problems by relying on their own thinking and three-quarters (76 percent) said students can figure out how to solve many mathematical problems without being told what to do.

Sixty-six percent agreed that students should master fundamental mathematical operations before tackling complex problems. Six in 10 held the view that students learn best when the teacher demonstrates what to do and asks questions if they don’t understand then provides practice.

There’s was also a consensus about what not to do. Most (61 percent) opposed the idea that students should be grouped homogeneously during teaching based on their prior performance.
In my view, K-12 students learning math ...

- Should be homogenously grouped during teaching based on their prior performance
  - Agree: 39%
  - Disagree: 61%
- Should master basic mathematical operations before tackling complex problems
  - Agree: 66%
  - Disagree: 34%
- Learn best when teacher demonstrates what to do, asking questions if they don't understand, and then by practicing
  - Agree: 61%
  - Disagree: 39%
- Can figure out how to solve many mathematics problems without being told what to do
  - Agree: 76%
  - Disagree: 24%
- Should be asked to solve problems and complete activities by relying on their own thinking
  - Agree: 82%
  - Disagree: 18%

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

The survey also revealed significant differences of opinion with divides based on whether postsecondary educators teach math or instead teach math education courses designed for prospective K-12 teachers.

Can figure out how to solve many mathematics problems without being told what to do.

<table>
<thead>
<tr>
<th></th>
<th>Agrees (82%)</th>
<th>Disagrees (18%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaches Math and Math Education</td>
<td>82%</td>
<td>18%</td>
</tr>
<tr>
<td>Teaches Math Education Only</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>Teaches Math Only</td>
<td>61%</td>
<td>39%</td>
</tr>
<tr>
<td>Total</td>
<td>76%</td>
<td>24%</td>
</tr>
</tbody>
</table>

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.
While 85 percent of those teaching only math education thought K-12 students should self-navigate many math problems, only 61 percent of those who taught only math courses (but not math education) agreed.

By contrast, 84 percent of respondents teaching only postsecondary math courses thought students should master basic mathematical operations before tackling more complex problems compared to just a slim majority (51 percent) of respondents teaching only math education.

**Should master basic mathematical operations before tackling complex problems.**

<table>
<thead>
<tr>
<th></th>
<th>Teaches Math and Math Education</th>
<th>Teaches Math Education Only</th>
<th>Teaches Math Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>64%</td>
<td>51%</td>
<td>84%</td>
</tr>
<tr>
<td>Disagree</td>
<td>36%</td>
<td>49%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Total: 66% Agree, 34% Disagree

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

Almost all math and math education teachers (96 percent) agreed that it’s ok to let K-12 students struggle and puzzle things out for themselves during math class.

Additionally, 78 percent thought that discussions in math classes should center on the students’ ideas and approaches.

Sixty-eight percent believed that certain math concepts simply need memorization and 64 percent felt that it’s important for teachers to first model a concept, allow practice, offer feedback, and then assign further practice.

However, distinctions in these views emerged when comparing instructors who solely taught math and those involved in math education with math instructors supporting this approach more strongly than those focusing on math education.
To what extent do you agree or disagree with the following statements about K-12 math instruction?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>During math class, it’s OK to let students struggle and puzzle things out for themselves</td>
<td>96%</td>
<td>5%</td>
</tr>
<tr>
<td>Discussion in math class should focus on students’ ideas and approaches</td>
<td>78%</td>
<td>22%</td>
</tr>
<tr>
<td>Some things in math just need to be remembered</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>It is important for teachers to first model, practice, give feedback, and assign practice</td>
<td>64%</td>
<td>36%</td>
</tr>
</tbody>
</table>

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

It is important for teachers to first model a math activity or problem, provide some practice and immediate feedback, and then assign practice.

<table>
<thead>
<tr>
<th>Department</th>
<th>Agree (partially agree, completely agree)</th>
<th>Disagree (partially disagree, completely disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaches Math and Math Education</td>
<td>57%</td>
<td>43%</td>
</tr>
<tr>
<td>Teaches Math Education Only</td>
<td>54%</td>
<td>46%</td>
</tr>
<tr>
<td>Teaches Math Only</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Total</td>
<td>64%</td>
<td>36%</td>
</tr>
</tbody>
</table>

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.
Eighty percent of postsecondary respondents who teach math (but not math education) said teachers should first model then practice, offer feedback, and then assign more practice for K-12 students. By contrast, only 54 percent of those teaching only math education courses shared this belief.

**Discussion in math class should focus on students’ ideas and approaches, no matter whether the answers are correct or incorrect.**

<table>
<thead>
<tr>
<th></th>
<th>Agree (partially agree, completely agree)</th>
<th>Disagree (partially disagree, completely disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaches Math and Math Education</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>Teaches Math Education Only</td>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>Teaches Math Only</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>Total</td>
<td>78%</td>
<td>22%</td>
</tr>
</tbody>
</table>

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.*

Eighty-six percent of postsecondary math education teachers agreed that discussions in K-12 math classes should focus on students’ ideas and approaches regardless of whether their answers are correct. Only 64 percent of postsecondary educators who teach only math courses agreed.

While most postsecondary instructors value culturally relevant pedagogy, the depth of this sentiment varies with their teaching focus and past K-12 teaching experience.

Almost all (95 percent) of postsecondary teachers who specialize in math education said it’s important to prepare teachers to use culturally relevant pedagogy that draws upon students’ home languages and/or culture in K-12 classrooms. But a lower share (72 percent) of respondents teaching math courses but not math education shared that view.
In your view, how important do you think it is to prepare teachers to use culturally relevant pedagogy that draws upon student’s home languages and/or cultures in K-12 classrooms?

Postsecondary survey respondents with at least six years of experience almost universally (95 percent) believed in the importance of training teachers to use such culturally relevant pedagogy in K-12 classrooms. That share dropped to 80 percent for postsecondary instructors with five years of experience or less—perhaps because they have had less time to evaluate the impact of this specific approach.

In your view, how important do you think it is to prepare teachers to accomplish the following objectives in the K-12 classroom: Fostering equity in the math classroom

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.*
Ninety-three percent of postsecondary survey respondents with five years of experience or less believed it’s important to prepare K-12 teachers to foster equity in the classroom as did 91 percent of those with six to 20 years of experience in higher education. However, just 80 percent of respondents with more than 20 years of experience in the postsecondary system agreed.

**How important is it for K-12 students to be fluent with math facts (e.g., single-digit addition, multiplication, times-tables)?**

<table>
<thead>
<tr>
<th></th>
<th>Teaches Math and Math Education</th>
<th>Teaches Math Education Only</th>
<th>Teaches Math Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>It doesn’t make a difference</td>
<td>47%</td>
<td>53%</td>
<td>69%</td>
</tr>
<tr>
<td>It is helpful for them to work on higher-order skills or conceptual problems, but not essential</td>
<td>53%</td>
<td>46%</td>
<td></td>
</tr>
<tr>
<td>It’s essential for them to work on higher-order skills or more conceptual problems</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.*

Perspectives about the importance of math facts differed based on whether postsecondary educators only teach math courses or teach math education. Sixty-nine percent of those who only teach math courses believed that it is essential for K-12 students to be fluent in math facts in order to engage in higher-order skills or conceptual problems. However, this belief was only shared by 46 percent of those teaching only math education.

**Varying Views on the Success of K-12 Math Preparation**

Fifty-two percent of postsecondary respondents believed that the K-12 education system prepared students somewhat or very poorly for postsecondary math courses. Differences emerged based on whether postsecondary educators had K-12 teaching experience.

Of those without K-12 teaching experience, only 36 percent believed K-12 students were somewhat or well-prepared for postsecondary math. Similarly, just 41 percent of those with five years of K-12 teaching experience or less thought the elementary/secondary system provided students with adequate preparation.

By contrast, most postsecondary educators with significant K-12 teaching experience—defined as six years or more—said that postsecondary students had been somewhat or well-prepared by their K-12 education. Fifty-eight percent of postsecondary educators with 6-20 years of experience and 62 percent of those with over 20 years of K-12 experience believed students are prepared.
How well has their K-12 education prepared most of the students you teach to succeed in postsecondary math courses?

<table>
<thead>
<tr>
<th>Experience Level</th>
<th>K-12 Educators</th>
<th>Postsecondary Educators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never taught in K-12</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>Less experienced in K-12 (&lt;=5 years)</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Moderately experienced in K-12 (6-20 years)</td>
<td>42%</td>
<td>58%</td>
</tr>
<tr>
<td>Highly experienced in K-12 (&gt;20 years)</td>
<td>39%</td>
<td>62%</td>
</tr>
<tr>
<td>Total</td>
<td>52%</td>
<td>49%</td>
</tr>
</tbody>
</table>

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

Postsecondary and K-12 Perspectives: Alignment or Disconnection?

This section of the report compares the views of K-12 and postsecondary teachers with respect to math instruction and teacher preparation.

Differing Perspectives on the Importance of Math Facts

When asked about the importance of K-12 students’ fluency in math facts—such as single-digit addition, multiplication, and times-tables—the perspectives of postsecondary and K-12 educators differed.

How important is it for K-12 students to be fluent with math facts (e.g., single-digit addition, multiplication, times-tables)?

- It doesn’t make a difference
- It is helpful for them to work on higher-order skills or conceptual problems, but not essential
- It’s essential for them to work on higher-order skills or more conceptual problems

*K-12 results show responses from teachers who teach math some or all of the time.

*Postsecondary results show responses from instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.
Fifty-six percent of respondents to the postsecondary survey thought it’s essential for K-12 students to be fluent in math facts in order to tackle higher-order or more conceptual problems, compared to 72 percent of K-12 math teachers.

Additionally, 44 percent of postsecondary math/math education teachers believed that while math fact fluency is helpful for students working on higher-order skills or conceptual problems, it is not essential. By contrast, 27 percent of K-12 educators shared that opinion.

**Postsecondary Instructors’ Beliefs on Best Practices and K-12 Teacher Practices in Reality**

Postsecondary educators were asked how often elementary school students should engage in specific activities during math instruction. Pre-K-5 teachers were asked how often their students engaged in those activities during math instruction in the school year.

Both clear differences and similarities emerged from the data about the two groups. In certain areas, postsecondary educators recommended that teachers put particular approaches into practice more frequently than pre-K-5 teachers reported they do in their classrooms. For instance, 83 percent of postsecondary educators recommend weekly (or more) integration of math into other subjects. In practice, only 62 percent of pre-K-5 teachers said they do so with students that often. An additional disparity can be found in the use of manipulatives. While 86 percent of postsecondary educators advocate their weekly (or more) use, 74 percent of pre-K-5 teachers have students use them at least weekly.

However, in other areas, the practices of elementary teachers were closely aligned with postsecondary perspectives. Eighty-nine percent of postsecondary educators believed students should communicate mathematically—through drawing, writing, and speaking—at least weekly. And 86 percent of elementary teachers said their students do so on a weekly basis or more.

**How often do your students this year do the following during math instruction? (K-12 Survey)**

**How often should elementary school students do the following during math instruction? (Postsecondary Survey)**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Postsecondary Weekly or More</th>
<th>Pre K-5th Weekly or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actively engage in solving problems rather than watching others solve problems</td>
<td>98%</td>
<td>95%</td>
</tr>
<tr>
<td>Explain how they arrived at their solutions</td>
<td>96%</td>
<td>92%</td>
</tr>
<tr>
<td>Share mathematical ideas working in pairs/groups with one another</td>
<td>91%</td>
<td>91%</td>
</tr>
<tr>
<td>Communicate mathematically using multiple methods such as drawing, writing, explaining out loud</td>
<td>89%</td>
<td>86%</td>
</tr>
<tr>
<td>Use manipulatives</td>
<td>86%</td>
<td>74%</td>
</tr>
<tr>
<td>Consider connections between math and other subjects</td>
<td>62%</td>
<td>83%</td>
</tr>
</tbody>
</table>

*K-12 results show responses from teachers who teach math some or all of the time.

*Postsecondary results show responses from instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.*
Similarly, on collaborative learning in math, both groups find common ground. Ninety-one percent of postsecondary respondents said students should share mathematical ideas working in pairs on a weekly basis or more. The same share of pre-K-5 teachers reported that students do so that often.

Most postsecondary teachers (96 percent) said students should explain how they arrived at their solutions at least every week and most pre-K-5 teachers (92 percent) indicated students were doing that.

The vast majority of postsecondary respondents (98 percent) called for students to actively engage in solving problems at least every week. Ninety-five percent of elementary teachers saw that level of problem-solving with their students.

Some comparisons between respondents from the higher education system and their K-12 counterparts differed depending on the type of teaching role that postsecondary respondents had.

| How often do your students this year do the following during math instruction? (K-12 Survey) | How often should elementary school students do the following during math instruction? (Postsecondary Survey) |
| How often should elementary school students do the following during math instruction? (Postsecondary Survey) |
| Weekly or More |
| Communicate mathematically using multiple methods such as drawing, writing in a math journal, and/or explaining something out loud | 82% | 87% | 97% |
| Consider connections between math and other subjects | 77% | 79% | 92% |
| Share mathematical ideas working in pairs/groups with one another | 84% | 91% | 99% |
| Use manipulatives | 74% | 86% | 96% |

*K-12 results show responses from teachers who teach math some or all of the time.

*Postsecondary results show responses from instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

Ninety-six percent of postsecondary instructors teaching only math education courses endorsed using manipulatives at least weekly in K-12 classrooms but just 74 percent of postsecondary instructors who taught only math courses agreed (matching the roughly three-quarters of elementary teachers who said their students do so).
Along the same lines, almost all (97 percent) of postsecondary specialists in math education advocated for K-12 students to communicate using multiple methods at least weekly compared to 82 percent of respondents teaching only math courses (more closely in line with the 86 percent of pre-K-5 teachers reporting their students do so).

**Instructional Resources**

K-12 teachers might choose to use a variety of different resources and tools to support math instruction. Survey results indicate that most K-12 math teachers regularly use math games (56 percent) and supplemental resources teachers purchase themselves (51 percent).

When postsecondary math education instructors were asked about the types of instructional resources K-12 teachers should ideally use for math instruction, their beliefs weren’t always in line with K-12 teachers’ actual practices.

For instance, 69 percent of postsecondary math education teachers believed K-12 teachers should make regular use of curriculum/materials created by district curriculum specialists. But just 4 in 10 K-12 math teachers reported they regularly did so.

**Which of the following do you use regularly to teach math? Select all that apply. (K-12 Survey)**

**In your view, what types of instructional resources should K-12 teachers use for math instruction? Select all that apply. (Postsecondary Survey)**

<table>
<thead>
<tr>
<th>Resource</th>
<th>K-12 Educators</th>
<th>Postsecondary Educators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math games</td>
<td>56%</td>
<td>85%</td>
</tr>
<tr>
<td>Curriculum/materials created by district curriculum specialists</td>
<td>40%</td>
<td>69%</td>
</tr>
<tr>
<td>Math apps</td>
<td>48%</td>
<td>68%</td>
</tr>
<tr>
<td>Free materials from online/lesson-sharing websites</td>
<td>56%</td>
<td>66%</td>
</tr>
<tr>
<td>Curriculum/materials teachers create from scratch</td>
<td>56%</td>
<td>66%</td>
</tr>
<tr>
<td>Supplemental resources purchased by the district or school</td>
<td>41%</td>
<td>66%</td>
</tr>
<tr>
<td>One or more core textbooks required by the district or school</td>
<td>46%</td>
<td>62%</td>
</tr>
<tr>
<td>One or more core textbooks NOT required by the district or school</td>
<td>15%</td>
<td>27%</td>
</tr>
<tr>
<td>Supplemental resources teachers purchase themselves</td>
<td>26%</td>
<td>51%</td>
</tr>
<tr>
<td>Other, please specify</td>
<td>4%</td>
<td>10%</td>
</tr>
</tbody>
</table>

*K-12 results show responses from teachers who teach math some or all of the time.

*Postsecondary results show responses from instructors who teach math education at least some of the time.
Survey results highlight a similar gap with supplemental resources purchased by the district or school. Nearly two-thirds of postsecondary respondents supported regular use of such materials in K-12 classrooms but just 41 percent of K-12 teachers took that approach.

While the survey responses typically show larger percentages of postsecondary respondents supporting the use of particular tools and lower shares of K-12 respondents reporting their use, data on the use of supplemental resources teachers purchase themselves stands out for showing the opposite pattern. The percentage of postsecondary math education instructors (26 percent) recommending use of such materials was about half the percentage of K-12 teachers (51 percent) saying they regularly do so.

Productive Struggle in Math

K-12 math teachers were asked to estimate the degree to which their students engage in “productive struggle” in math in order to delve deeply into understanding the mathematical structure of problems and relationships among mathematical ideas rather than simply seeking correct solutions.

Their responses were largely aligned with postsecondary instructors who taught math courses (but not math education) in which at least some students were enrolled in teacher preparation programs. One-fifth of postsecondary respondents said their students engage in productive struggle on a daily basis. One-quarter of K-12 math teachers said their students did. Nearly half of postsecondary respondents (49 percent) cited weekly productive struggle. Forty-five percent of K-12 math teachers saw it happening to that degree.

**This school year, about how often do your students engage in “productive struggle” in math, i.e., to delve deeply into understanding the mathematical structure of problems and relationships among mathematical ideas, rather than simply seeking correct solutions, even if that causes students some discomfort.**

*K-12 results show responses from teachers who teach math some or all of the time.

*Postsecondary results show responses from instructors who teach math courses (but not math education) in which at least some students are enrolled in teacher preparation programs.
Perspectives on Training and Professional Development

In addition to perspectives on teaching practices, the survey research also examined experiences with math training and professional development.

Reading Materials in Math Education

Most K-12 math teachers (56 percent) said they had not read the work of any math scholars, experts, or practitioners in their teacher preparation programs or in professional development. And 38 percent of postsecondary survey respondents said they had not introduced the work of those types of authors to students in their classes.

When respondents had read or introduced such materials, they most commonly cited the work of Jo Boaler, a professor at the Stanford Graduate School of Education.

* When it comes to math scholars, experts, or practitioners, whose work have you read in your teacher preparation program or in professional development? Select all that apply. (K-12 Survey)
* What math scholars, experts, or practitioners’ work do you introduce to your math or math education classes? Select all that apply. (Postsecondary Survey)

Factors like years of experience and teaching specialization may influence the extent to which postsecondary respondents do or do not introduce the work of math experts to their classes. For instance, 47 percent of the most seasoned educators with more than 20 years of experience said they had not introduced this type of content to their classes compared to 37 percent of respondents with 6-20 years in postsecondary education. Just 26 percent of respondents with five years of experience or less had not presented this material in their classes.

Only 23 percent of respondents teaching only math education courses did not include the work of math scholars/experts in their classes compared to 61 percent of postsecondary instructors who teach math courses but not math education for teacher preparation.
I do not introduce any math scholars’ work in my classes.

*Postsecondary results show responses from instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

**Training to Support Students with Math-Related Learning Disabilities**

Most K-12 math teachers said they had a little training (32 percent) or no training at all (41 percent) on supporting students with math-related learning disabilities.

Few postsecondary math education instructors appear to specialize in or concentrate on teaching about those disabilities.

Ninety percent of respondents said they spend half of their course time or less covering this topic. Just 10 percent indicated they dedicated more than half of their courses to addressing it.
How much pre-service or in-service training have you received on supporting/intervening with students with math-related learning disabilities?

*Results show responses from K-12 teachers who teach math some or all of the time.

Approximately what percentage of your math education courses do you spend covering math learning disabilities?

*Results show responses from postsecondary instructors who teach math education at least some of the time.
Survey Results on Math Anxiety

Math anxiety—on the part of both K-12 students and prospective K-12 math teachers—may be something that will also need to be addressed in teaching training.

Three-quarters of K-12 math teachers reported that their current students experienced some or a lot of math anxiety. Nearly 9 in 10 postsecondary respondents indicated their students also faced this challenge. Only 17 percent of K-12 math teachers and 17 percent of postsecondary respondents said that they personally have math anxiety.

To what extent, if any, do you and your current students experience math anxiety?

* K-12 results show responses from teachers who teach math some or all of the time.
* Postsecondary results show responses from instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

Perspectives on Math Achievement

The survey research for this project examined a variety of factors that shed light on how educators see math achievement.

Student Grouping by Ability or Achievement for Math Instruction

K-12 math teachers and postsecondary survey respondents differ markedly on when they think schools should start grouping students by ability or achievement for math instruction, with some classes or groups exposed to more advanced curricula.
Half of K-12 math teachers believed that this type of grouping should begin in elementary school. That’s more than two times higher than the share of postsecondary educators (20 percent) saying it should start at that point.

Just 1 in 10 K-12 math teachers thought ability grouping should begin in high school. The share of postsecondary educators pointing to high school was three times higher.

In your view, when, if ever, should schools start grouping students by ability/achievement for math instruction, with some classes or groups exposed to curricula that is more advanced?

![Bar chart showing responses to the question about when to start grouping students by ability/achievement for math instruction.]

*K-12 results show responses from teachers who teach math some or all of the time.

*Postsecondary results show responses from instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

Notably, 23 percent of postsecondary educators oppose any form of ability-based grouping in math, compared to 12 percent of K-12 educators.

K-12 teachers’ views about when to start grouping students by achievement depended on the grade levels they taught.
In your view, when, if ever, should schools start grouping students by ability/achievement for math instruction, with some classes or groups exposed to curricula that is more advanced?

*Results show responses from K-12 teachers who teach math some or all of the time.

More than 7 in 10 pre-K-2 teachers said ability grouping should begin in elementary school. The percentage of respondents sharing that view dropped to 57 percent among teachers in grades 3-5, 43 percent for those teaching grades 6-8, and just 23 percent for high school teachers (grades 9-12).

In your view, when, if ever, should schools start grouping students by ability/achievement for math instruction, with some classes or groups exposed to curricula that is more advanced?

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

<table>
<thead>
<tr>
<th>Grade Levels</th>
<th>Elementary</th>
<th>Middle School</th>
<th>High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-K-2</td>
<td>72%</td>
<td>14%</td>
<td>4%</td>
</tr>
<tr>
<td>3-5</td>
<td>57%</td>
<td>26%</td>
<td>6%</td>
</tr>
<tr>
<td>6-8</td>
<td>43%</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>9-12</td>
<td>23%</td>
<td>34%</td>
<td>27%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching background</th>
<th>Elementary</th>
<th>Middle School</th>
<th>High School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math and Math Education</td>
<td>20%</td>
<td>27%</td>
<td>33%</td>
</tr>
<tr>
<td>Math Education Only</td>
<td>20%</td>
<td>20%</td>
<td>27%</td>
</tr>
<tr>
<td>Math Only</td>
<td>21%</td>
<td>35%</td>
<td>30%</td>
</tr>
</tbody>
</table>

| Total                 | 20%        | 27%           | 30%         | 23%         |

*Never—schools should not group students by ability/achievement for math instruction.
One-fifth of postsecondary respondents supported grouping students at the elementary level. Responses were similar across teaching specializations. One notable difference was that respondents teaching only math courses (and not math education) were less likely than their counterparts teaching only math education to say schools should never group students by ability level for math instruction (14 percent vs. 33 percent, respectively).

**Which High School Students Should Take Calculus?**

The discussion on whether all students should study subjects like calculus in high school is one where both K-12 and postsecondary educators share similar views.

Only a small portion of educators from both groups (1 percent of K-12 and 2 percent of postsecondary) believed that high school students should not take calculus. A small percentage—5 percent of K-12 and 4 percent of postsecondary educators—thought it should be a mandatory class for all students.

### In your view, who should take calculus in high school?

- **Postsecondary Educators**
  - Restricted access: 57%
  - Required for all students: 4%
  - Optional for all students: 37%
  - No students: 2%

- **K-12 Educators**
  - Restricted access: 59%
  - Required for all students: 5%
  - Optional for all students: 35%
  - No students: 1%

*K-12 results show responses from teachers who teach math some or all of the time.*

*Postsecondary results show responses from instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.*

A substantial share believed in a more flexible approach: 35 percent of K-12 and 37 percent of postsecondary educators thought that calculus should be optional for all students.

A majority from both sectors of education (59 percent of K-12 and 57 percent of postsecondary) suggested a more restrictive approach, advocating for calculus only for students who demonstrate readiness.
Differences in these views become more apparent when considering postsecondary educators’ specializations. For instance, 72 percent of postsecondary educators who exclusively teach math courses favored restricted access to calculus. Less than half of those focused on math education (47 percent) said there should be such restrictions on access to this subject.

### Who should take calculus in high school?

<table>
<thead>
<tr>
<th>Role</th>
<th>Restricted access</th>
<th>Required for all students</th>
<th>Optional for all students</th>
<th>No students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaches Math and Math Education</td>
<td>53%</td>
<td>6%</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Teaches Math Education Only</td>
<td>47%</td>
<td></td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>Teaches Math Only</td>
<td>72%</td>
<td></td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>57%</strong></td>
<td><strong>37%</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Results show responses from postsecondary instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

**Teachers’ Perspectives on Their Own Past Math Achievement**

The way that K-12 and postsecondary teachers see their own math achievement and their own experiences as math students might influence how they view instructional practices for math. Survey data show some differences between K-12 teachers and their postsecondary peers in this area.

In undergraduate math courses, for instance, 49 percent of K-12 teachers earned As and 43 percent received Bs. This contrasts with postsecondary educators where 69 percent earned As and 27 percent received Bs.
What grades did you typically earn in math during your own years in K-12 and postsecondary education?

<table>
<thead>
<tr>
<th></th>
<th>As</th>
<th>Bs</th>
<th>Cs</th>
<th>Ds</th>
<th>Fs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary school math (K-12)</td>
<td>70%</td>
<td>24%</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary School Math (Postsecondary)</td>
<td>84%</td>
<td>14%</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle and high school math (K-12)</td>
<td>74%</td>
<td>38%</td>
<td>14%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Middle &amp; High School Math (Postsecondary)</td>
<td>53%</td>
<td>43%</td>
<td>14%</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>Undergraduate math (K-12)</td>
<td>69%</td>
<td>43%</td>
<td>4%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Undergraduate Math (Postsecondary)</td>
<td>53%</td>
<td>49%</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*K-12 results show responses from teachers who teach math some or all of the time.

*Postsecondary results show responses from instructors who teach math education or math courses in which at least some students were enrolled in teacher preparation programs.

In elementary school math, 7 in 10 K-12 teachers indicated that they typically earned As and roughly one-quarter (24 percent) said they earned Bs.

In middle and high school math, 46 percent of K-12 teachers indicated they earned As with 38 percent receiving Bs and 14 percent getting Cs. Almost three-quarters (74 percent) of postsecondary teachers said they earned As with 22 percent receiving Bs and 4 percent getting Cs.

A deeper dive into the data also highlights differences between postsecondary educators based on their teaching specializations. More than 8 in 10 (81 percent) of postsecondary instructors teaching only math courses said they earned As in middle/high school math compared to 64 percent of those teaching only math education courses.
The distinctions became more pronounced in undergraduate math courses. Eighty percent of those teaching math only received As but that number dropped to 54 percent for instructors teaching solely math education courses.
Parental Engagement Strategies

Parental involvement can also play a role in students’ math achievement. In the survey, K-12 teachers shed light on strategies they shared with parents to augment their children’s math learning at home during the current academic year.

At the forefront, more than half of K-12 math teachers advised parents to foster a growth mindset in math (55 percent) and equipped them with resources for aiding their children’s at-home studies (55 percent).

To support students’ math learning at home, which activities have you encouraged parents to engage in with their children during the current school year? Select all that apply.

- Sharing resources parents can consult to help their children learn math at home
- Promoting a growth mindset around learning math
- Incorporating math concepts and conversations about math into everyday activities
- Sharing math-related activities parents and children can do together at home
- Suggesting that parents share information on how they use math at work and/or in their daily lives
- Avoiding negative statements about their own experiences with math
- Attending math-focused events at school with their children
- Reading books with their children with math-related themes
- Letting children struggle with math homework rather than immediately jumping in and providing the solution
- Sharing resources parents can consult to help their children learn math at home

*Results show responses from K-12 teachers who teach math some or all of the time.

The poverty levels in school districts appear to impact teachers’ strategies for parental engagement. For instance, 37 percent of math teachers in more affluent districts — with 50 percent of students eligible for free-reduced price meals or less—steered parents away from making negative statements about their own experiences with math. In comparison, just 18 percent of teachers working in higher-poverty districts where most students qualified for meal assistance provided the same type of advice.
Avoiding negative statements about their own experiences with math

Gauging Student Achievement

When asked about student learning, 37 percent of K-12 math teachers said that most of their students are falling behind in math.

What percentage of your students do you estimate are currently below grade level in math?

In higher-poverty districts where more than half the student population qualifies for free or reduced-price lunches, 46 percent of math teachers said that most of their students were below grade level in math. This perspective sharply contrasts with wealthier districts, where only 19 percent shared the same assessment.