

# Accelerating Learning with Workplace Math Skills

How Microsoft Math Assistant\* compares with Google Docs\* to support the development of accessible math skills



## Executive Summary

Following the disruption of in-person learning in 2020, trends have emerged suggesting large gaps in student growth when compared to pre-pandemic levels. In 2021, students performed an average of ten points lower in mathematics than in previous years<sup>1</sup>. Some estimates suggest that this translates to five months behind previous cohorts, with sub-groups like predominately Black schools or those serving students with low socio-economic statuses six and seven months behind, respectively.

“Our economy depends on math and science literacy. This is not only a concern for those with careers in those topics but also for the public at large.”<sup>2</sup>

— Julia Philips, National Science Board

Schools can help reduce these learning gaps by focusing on tools and strategies that support Universal Design for Learning (UDL) in order to better ensure that students receive the resources that they need to access and engage with learning materials. While many schools provide their students with screen reading software, these tools commonly struggle to read mathematic equations and don't provide opportunities to remediate specific mathematic skills. With features like step-by-step explanations, practice quiz generation, and reading preferences with Immersive Reader, Math Assistant in OneNote provides students with the tools that they need to access, understand, and self-direct their learning to facilitate mastery of important math skills without relying on third-party extensions.



As schools and teachers made dramatic shifts in their instructional practices throughout 2020 and 2021, students faced increased learning challenges that have had a substantial impact on their academic growth. According to a report focused on literacy and math skills in kindergarten through eighth grade, literacy skills were “modestly” impacted; however, the same report found math skills were “substantially” impacted, particularly in fifth through eighth grades which were 12-16 weeks behind previous cohorts<sup>3</sup>.

### Predicted Long-term Impact for Current Students<sup>4</sup>

\$55,000

Estimated lifetime wage loss for today's students

\$158 billion

Annual economic impact on U.S. workforce

<sup>1</sup> Source: [COVID-19 and education](#)

<sup>2</sup> Source: [What do the data say about the current state of K-12 STEM education in the US?](#)

<sup>3</sup> Source: [EdSurge](#)

<sup>4</sup> Source: [The lingering effects of unfinished learning](#)

The mathematics National Assessment of Educational Progress (NAEP) exam is given to U.S. public school students every two years in the fourth, eighth, and twelfth grades. This assessment is used to demonstrate how students in the U.S. compare with those from 36 other developed countries around the world using the Program for International Student Assessment (PISA)<sup>5</sup>. Over time, students in the U.S. have been losing ground in mathematics literacy when measured against their global peers, falling to 25th in mathematics for high school students in 2018. Domestically, performance data suggest substantial achievement level gaps between students with disabilities when compared to their peers, the former average 35 points lower on the twelfth-grade math assessment<sup>6</sup>.

The state of math education in the U.S. stands in stark contrast to the country’s continued demand for employees in STEM fields. Over the past ten years, STEM vocations have experienced 2.3% annual growth, lower unemployment rates, and higher salaries than non-STEM careers . As workforce trends continue to see an emphasis on STEM careers<sup>7</sup>, it is becoming increasingly important that schools prepare students with the workplace readiness skills they need to compete in a global market.



**STEM Careers in the U.S.<sup>8</sup>**

<b>\$22K higher median salary than non-STEM careers</b>	<b>50% lower unemployment rate</b>
<b>23% of U.S. workforce</b>	<b>2.3% annual growth rate</b>

<sup>5</sup> Source: [Elementary and Secondary STEM Education](#)

<sup>6</sup> Source: [National Student Group Scores and Score Gaps](#)

<sup>7</sup> Source: [The STEM Labor Force of Today](#)

<sup>8</sup> Source: [The STEM Labor Force of Today](#)



## Rationale

By the end of the 2020-21 school year, 98% of students across the U.S. had the option of returning to in-person learning<sup>9</sup>. While spring 2021 assessment data saw some improvement over initial estimates, students, on average, were four months behind in math at the conclusion of the school year. Unfortunately, these trends continued to perpetuate historical racial and economic inequities within U.S. schools. While students on average were four months behind pre-pandemic levels, students at predominantly Black schools were six months behind, doubling the gap from the beginning of the school year<sup>10</sup>.

The substantial learning deficit our students experienced only compounds pre-pandemic concerns about math literacy preparedness<sup>11</sup>. To address this daunting challenge, CAST, the organization that developed the UDL framework and guidelines, created a structure "to ensure that all learners can access and participate in meaningful, challenging learning opportunities."<sup>12</sup> When students achieve this "expert learner" status, they are "resourceful and knowledgeable, strategic and goal-directed, purposeful and motivated."<sup>13</sup>

John Hattie's visible learning meta-analysis seeks to identify which influences have the largest impact on student learning. According to his report, any influence with an effect size of 0.4 or higher falls into the "Zone of Desired Effects."<sup>14</sup> Concepts like self-reported grades and self-efficacy—effect sizes of 1.33 and 0.92, respectively<sup>15</sup>—exist at the intersection of the expert learner and visible learning structures. Consequently, when educators focus their attention on finding strategies and resources that empower students to better self-assess and respond to their current level of mastery, they can expect substantial academic growth for their students.

<sup>9</sup> Source: [COVID-19 and education](#)

<sup>10</sup> Source: [True Impact of the COVID Slide](#)

<sup>11</sup> Source: [Census Bureau Reports](#)

<sup>12</sup> Source: [The UDL Guidelines](#)

<sup>13</sup> Source: [The UDL Guidelines](#)

<sup>14</sup> Source: [Hattie's Barometer of influence](#)

<sup>15</sup> Source: [Hattie Ranking](#)



## Learning Scenario

The following scenario compares the step-by-step process that a representative ninth grade Algebra 1 student would complete to write an equation using Microsoft Math Assistant in OneNote, Google Docs, and the Equatio\* Chrome extension. Additionally, this scenario showcases the process that a student would take to receive personalized instruction through these tools.

### At a Glance

#### Topic

Solving Linear Equations

#### Subject

Algebra 1

#### Grade Level

9th grade

#### Accommodation

Ensure that math instruction is accessible and personalized to the student's needs.

# Step-by-step Comparison

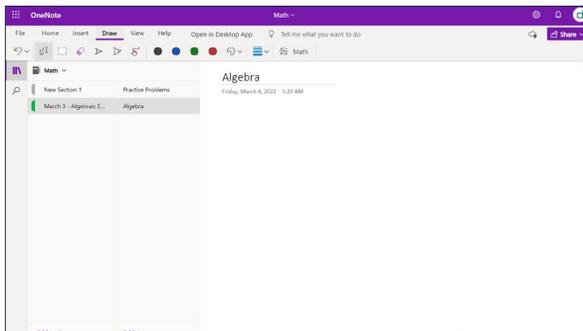
## Test Devices

In conducting this comparison, the K-12 Blueprint team tested the following devices and configuration:

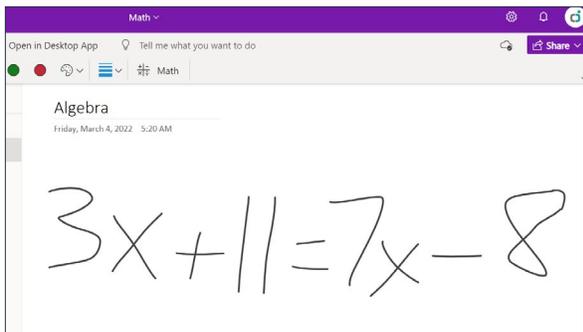
- **Microsoft Surface Go 2** running Windows 11 Pro 22000.493
- **ASUS Chromebook Flip C436** running 98.0.4758.91 (Official Build) (64-bit)

## Writing Math Equations in OneNote

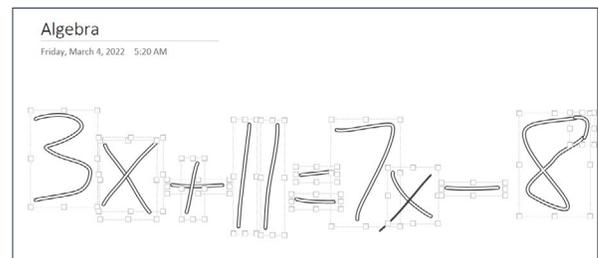
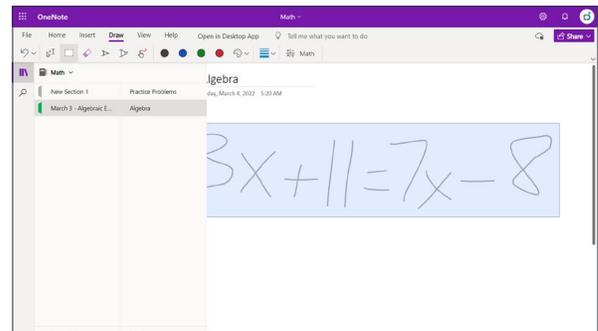
1. Open a new page in OneNote > Click Draw.



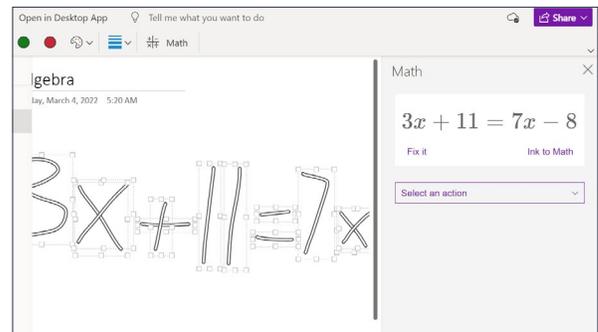
2. Use the touchscreen to write a math equation.



3. Use Marquee Select to highlight drawn text.

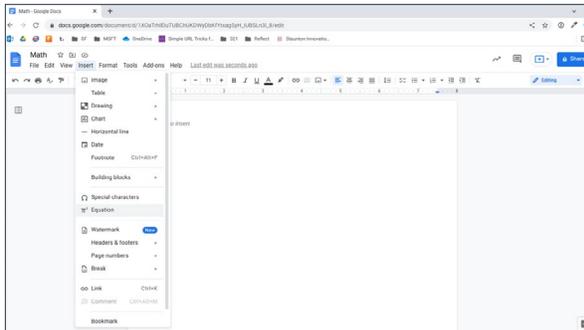


4. Click Math to convert drawing to equation format

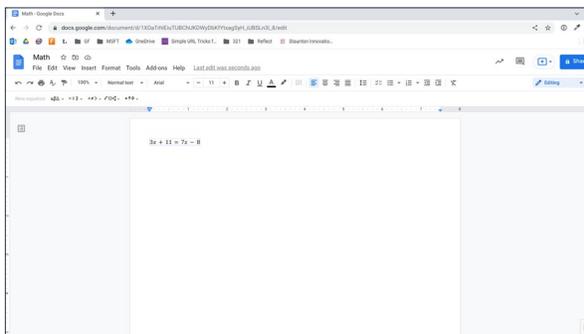


## Writing Math Equations in Google Docs

1. Click Insert > Equation.

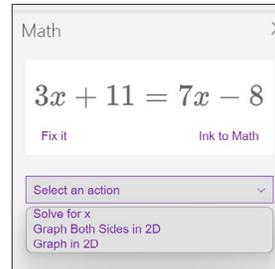


2. Type equation using keyboard.

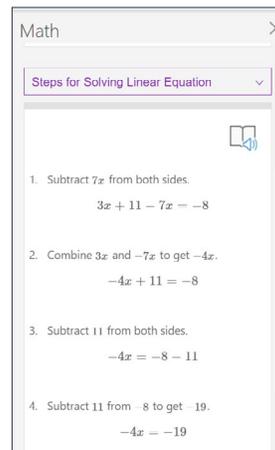
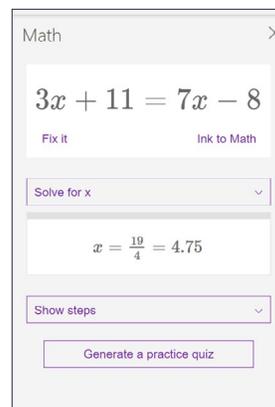


## Accessible Math using OneNote Math Assistant

1. Click Select an action > Solve for x.



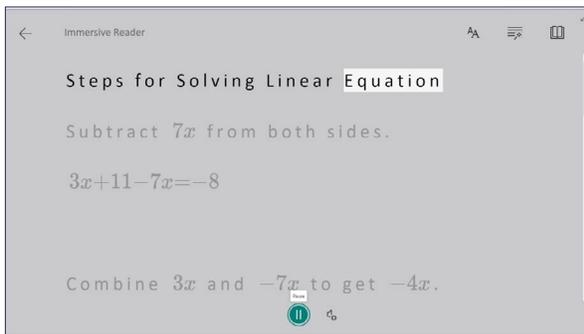
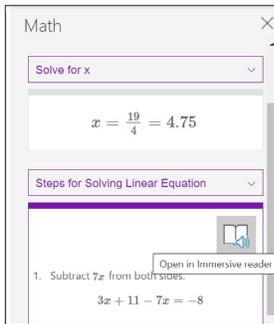
2. Click Show steps. Scroll through the step-by-step explanation.



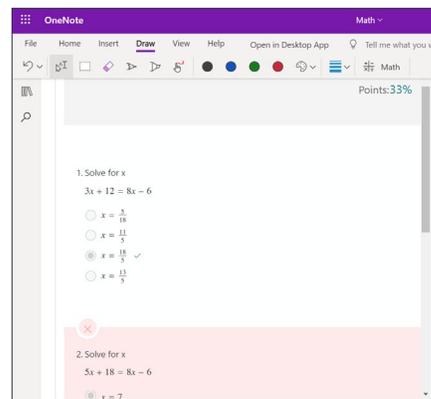
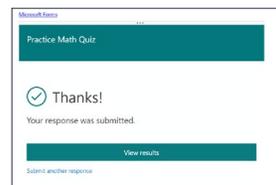
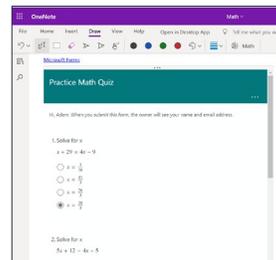
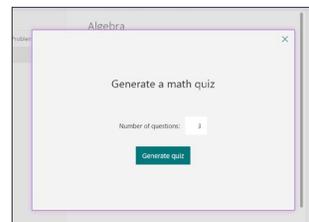
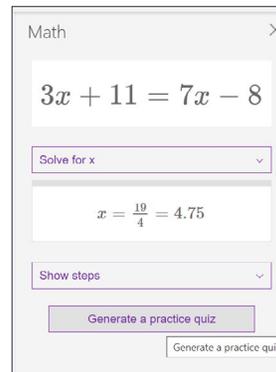
6. Fraction  $\frac{-19}{-4}$  can be simplified to  $\frac{19}{4}$  by removing the negative sign from both the numerator and the denominator.

$$x = \frac{19}{4}$$

- Click the Immersive reader icon to read the steps aloud.



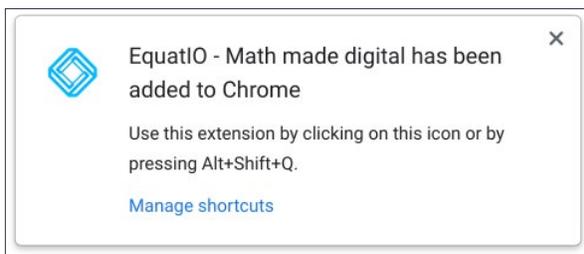
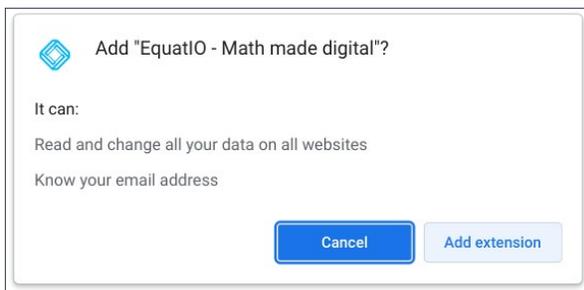
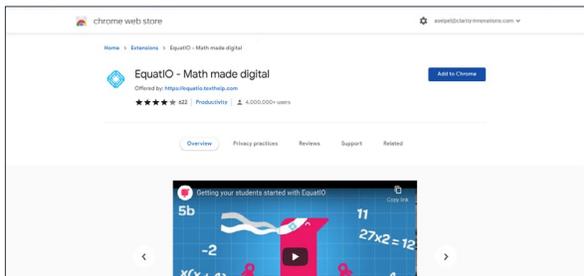
- Click Generate a practice quiz to further develop skills as needed.



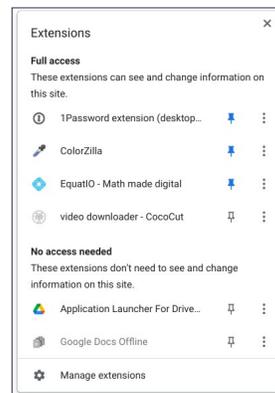
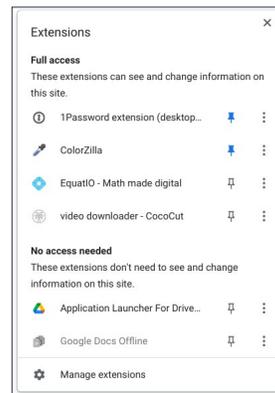
## Accessible Math Using Google Docs

Google Docs does not have any built-in accessible math features and depends upon installing third-party extensions.

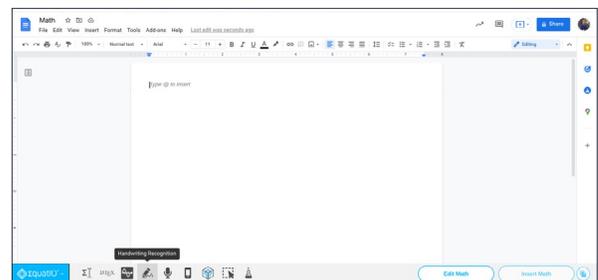
1. Open Chrome and go to the [Google Chrome Web Store](#).
2. Use the search tool to locate Equatio.
3. Click Add to Chrome > Add extension.



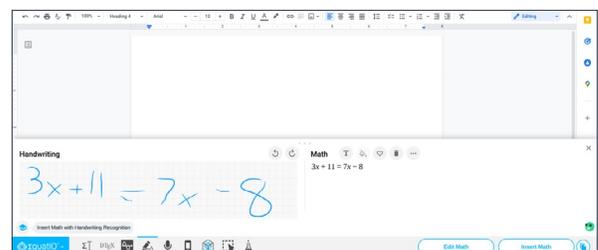
4. Click the Extension icon in top-right of Chrome > Click Pin icon to make Equatio visible in toolbar.



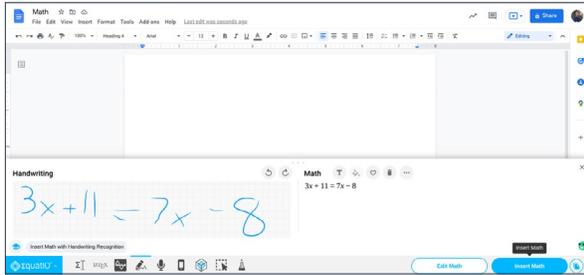
5. Click the Equatio extension icon to launch the tool.
6. Click Handwriting Recognition icon on the toolbar.



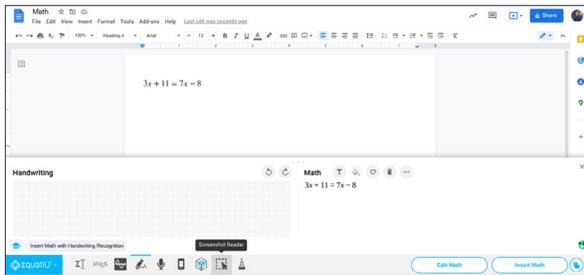
7. Write the equation with the touchscreen or a mouse.



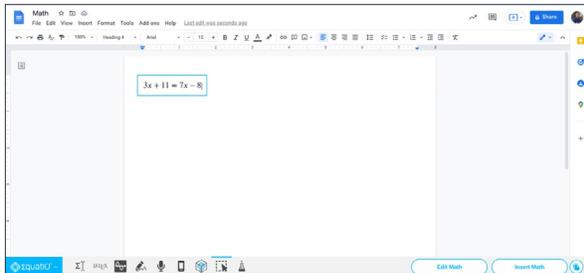
8. Click Insert Math.



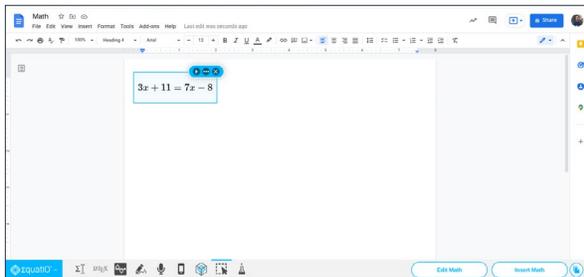
9. Click on Screenshot Reader.



10. Trace the equation.



11. Press Play to read aloud.



## Conclusion

Microsoft's commitment to accelerating learning for all students extends throughout its products and across subjects, including mathematics. Math Assistant in OneNote empowers students to access and engage with mathematical content and concepts in more personalized ways. Students move beyond the traditional experience of practicing a common set of equations and begin to create individualized, on-demand exercises. Additionally, with built-in process explanations and Immersive Reader, students can access the instruction that they need when they need it and in their preferred format and language.

For comparison, the Google equation editor only allows for typed entry and offers no built-in accessibility features, instead relying upon third-party extensions such as Equatio. While offering multiple means of equation entry and read aloud, Equatio lacks the ability to provide explanations of the mathematical concepts and doesn't give students the ability to generate supplemental practice questions.

Tool	Equation Input	Accessibility Features	Personalized Instruction and Feedback	Equation Read Aloud
Microsoft Math Assistant in OneNote	Drawn or typed	Read aloud Multiple means of entry	Show steps Generate a practice quiz	71 languages or dialects <sup>16</sup>
Google Docs	Typed	None	None	0
Google Docs with Equatio	Multiple entry options	Read aloud	None	1

Providing a rich suite of mathematical tools without relying upon a third-party extension, Microsoft's Math Assistant offers a more comprehensive and accessible solution that helps students become expert learners and contributing members of the STEM workforce.

<sup>16</sup> Source: [Languages and products supported by Immersive Reader](#)