STEMscopes™ MATH

A Guide to Learning Loss in Math

The Definitive Guide to Asking the Right Questions in Your Classroom

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What Elementary Schools Can Do to Combat COVID Learning Loss in Math

At the end of 2020, edtech companies and the testing nonprofit, the Northwest Evaluation Association (NWEA) were reporting the same trend: students' math learning had suffered the most from the school closings. In one finding reported by the *EdSurge* news organization, grades 5-8 had lost three to four months of progress in math (compared to just one to three months in reading for grades K-8). In another analysis, math students in grades 4-7 had lost "four to seven weeks" while grades 5-6 were "more than 12 weeks behind beginning-of-year expectations."

When they compared the 2019 math scores on the MAP Growth assessment to those in 2020, *NWEA researchers* concluded that students in grades 3-8 were "about 5 to 10 percentile-points lower in math" than their 2019 counterparts. The report added that "Black and Hispanic students in upper elementary saw the worst learning losses." (Student achievement in reading was the same as in 2019.)

What should be noted is NWEA's statement that many students were unavailable due to a lack of "reliable technology" or because they disengaged from school due to "economic, health, or other factors." It's highly likely that no access to technology and the other factors cited have kept those students away from their teachers and learning resources since the spring of 2020. Which means that those lower scores on the MAP test and the companies' assessments may be the tip of the iceberg.

What's the Outlook for Math Learning Loss?

While there has been enough testing to establish that U.S. students have experienced learning loss in math, no one currently knows the full breadth or depth of the problem. As a December 2020 *Education Week article* put it, "… none of the research so far is granular enough to say that students have lost specific skills, content, or foundations in math, like fractions or number sense." As a result, it's hard to determine the outlook for math achievement in 2021 and 2022.

Most states won't be able to provide much input for the near future. During 2020, *state testing was canceled* due to COVID-19, and advocacy groups are pushing for the same in 2021. In addition, the National Center for Education Statistics is postponing National Assessment of Educational Progress (NAEP) tests until 2022. While those cancellations and postponements keep schools and students from fretting about low scores, they also limit insight into learning loss and any patterns it may be taking.

Educators may be able to get some idea of what the future holds by looking at the past. The Consortium for Policy Research in Education (CPRE) suggests that "COVID slide" may have a lot in common with learning loss caused by a natural disaster, e.g., Hurricane Katrina's effect on New Orleans students in 2005.

The CPRE *described* New Orleans' situation:

> New Orleans schools closed abruptly in early August 2005. Though a few schools located on high ground were able to start again in early 2006, the majority of children weren't back in New Orleans schools until the following school year or later. … Some had gone to school for a few months in Texas or other parts of Louisiana, but most were out of school until they returned to New Orleans.

When the students were able to return to school, researchers found that they *were more than two years below their grade level,* on average. And like now, the most dramatic learning losses were in math.

The CPRE reported, "The degree of learning loss couldn't be predicted by family income, prior school, student age, or pre-Katrina grade level. … It often took multiple years of individualized attention to resolve the largest learning losses."

Being out of school for so many months accounted for some of the academic loss. But researchers found that stress and trauma from the experience adversely affected students' post-Katrina academic performance, sometimes for years. They also found evidence that "test anxiety and post-traumatic stress may have fed off each other."

Like those students in 2005, students in 2020 have had their lives suddenly disrupted. In addition to abruptly losing their normal school routine, many also experienced financial instability and food insecurity as caregivers lost jobs. They may have had to face the possibility a loved one dying, and some have had to deal with the pain of it happening. All that trauma and stress could worsen a student's math anxiety (and vice versa).

Current distance learning technologies have allowed quite a few students to continue their studies during the 2020-2021 school closings. So, the current learning loss may not be as widespread as in those post-Katrina schools.

However, some students won't or can't engage with distance learning. And, as pointed out, students are currently dealing with significant stress and trauma. Since those circumstances are similar, the post-Katrina learning loss may serve as a useful reference for the COVID learning loss.

Attacking Learning Loss by Supporting Students

Referring to the post-Katrina learning loss gives educators a starting point for determining the practices that will ease students' stress, trauma, depression, and math anxiety so that they can recover their lost learning as quickly as possible. Below are some best practices that educators can implement across schools, in the classroom, and with parents.

- ### School-Level Best Practices

  The *Education Week* article cited experts' advice that teachers should be partnered with school psychologists and similar support staff. Those partnerships will make it easier to recognize when a child is struggling with stress and/or trauma and provide effective support. The teacher-counselor teams would also look out for students' math anxieties since, as previously mentioned, the post-Katrina research found that test anxiety and post-traumatic stress may feed off each other.

  Another issue to consider is that the CPRE revealed that the New Orleans elementary schools that focused on skill recovery ended up scoring poorly on state accountability tests. When they refocused on grade-level instruction, their performance on state tests improved. However, school leaders worried that students had not recovered that lost learning.

  Some states are taking measures that remove that dilemma. E.g., New York state is asking the federal government to waive mandated testing once more. Georgia and South Carolina are drastically reducing how much end-of-course exams count toward students' overall course grades. Schools in states that take such measures can focus on recovery without the pressure of those accountability tests.

  In states that are moving forward with testing as usual, educators will have to relieve themselves of the pressure by readjusting their priorities. Poorer performances, particularly in math, are extremely likely right now, but the real priority is evaluating students via growth assessments or looking at their ability to articulate concepts. Assessments used to gauge this progress should be given at least equal weight by the school and district.

  The final schoolwide measure that researchers recommend is a Multi-Tiered System of Supports (MTSS) framework. MTSS is a proactive school framework that uses assessments and data analysis to identify students with academic or behavior issues so educators can quickly provide appropriate support. E.g., the framework can help identify gaps in students' expected math knowledge and the type of intervention needed.

The "tiers" of MTSS are the degrees of intensity in instruction and intervention, with Tier 1 being regular instruction. Tier 2 involves interventions for groups of students, and Tier 3 is interventions for specific students. While implementing MTSS requires ongoing professional development, the early assessment and timely interventions can help students reach on-grade achievement sooner.

- **Teacher-Level Best Practices**

  Experts in math anxiety suggest integrating short anti-stress exercises into instruction, even in distance learning. They also advocate that remote teachers explicitly ask about students' stress levels since it can be difficult to properly read expressions and body language via a screen.
  Students in reopened elementary schools will need emotional support as they readjust to the classroom routine. Small things like sharing manipulatives with a classmate will be a challenge for children who have been learning on their own for months (and being told that human contact causes sickness) and could disrupt the flow of classroom learning. Teachers can figure out workarounds such as individual manipulative kits, sticking with virtual manipulatives, or making disinfection protocols part of the class routine so students feel at ease.

- **Best Practices for Involving Parents in Math Instruction**

  One possible reason behind students' significant learning losses in math is that their parents and caregivers are avoiding engaging in math activities with them. This may be due to the adults' own math anxiety. In fact, they may be *unintentionally transmitting math anxiety* to their children. Also, parents may be unfamiliar with new instructional methods for math that a district may have introduced. If a district has moved to a new instruction model, teachers can use their own training as an example of how to familiarize parents with the model. By recalling their own experiences, they can figure out which procedures could confuse parents and use short videos or chats to get parents up to speed. The Harvard Graduate School of Education has shared *ways* to have parents work on math activities with their young children.

Teaching Strategies for Combating Learning Loss

Educators can expect that a good portion of their students have forgotten or not fully mastered some of the math concepts and skills taught before and during the last school year. In addition, in the chaos of the spring 2020 closing, some concepts and skills may have been touched on just briefly, if at all.

Below are instructional strategies that help students fill learning gaps and quickly master new concepts.

- **Reteaching**

  Reteaching involves using an assessment to pinpoint any lesson content that students did not understand. That content is then retaught using an approach that differs from the original. E.g., if the original approach used manipulatives, the new approach may use games or investigations.

  (At times, teachers may find that a student has grasped the math concept but is struggling with the mechanics. As a result, that student understands what to do but performs the procedure very slowly. In such instances, the teacher can assign fluency builders, such as small math games, for practicing the mechanics.)

  Reteaching can be done via small group instruction, tutorial groups (students teaching students), or learning stations. These activities offer a lot of opportunities for differentiated instruction because every student can practice with materials (e.g., games, manipulatives, videos) in a way that's meaningful for them.

  When they can't be in a classroom with students, teachers can use online videos provided by digital platforms or Learning Management Systems to reteach a concept or skill. In fact, videos make it possible to reteach multiple math topics simultaneously. The teacher simply assigns different videos to different individuals or groups, regardless of whether the instruction is happening remotely or in the classroom.

- **Scaffolding**

  With scaffolding, teachers help students learn new concepts by breaking up a learning experience, idea, or skill into parts. Then they provide students with assistance in learning each part. E.g., number patterns can be broken down into two discrete concepts: (1) tables and graphs and (2) additive and multiplicative properties. When put together, students get the whole picture, and teachers can be confident that their class has mastered that learning standard.

Below are examples of scaffolding:

- *Think Alouds* allow students to examine the reasoning used in solving a math problem and acquire it for themselves. Teachers or students talk through the details of a problem and then their thinking process as they try to solve the problem. This practice allows

students to focus on solving math problems one step at a time, figure out if there's anything they don't understand, and learn from their classmates' approach to solving the math problem. It also helps teachers monitor students' understanding and progress.

- *Paired Inquiry-Based and Writing Activities* allow for in-depth investigations and reflections via a collaborative, hands-on activity followed by an explanatory or review writing exercise, or a quick assessment. E.g., students can do a hands-on activity (if they're at home, the teacher can support them via Zoom). Next, they do an independent practice assignment that lets them demonstrate their understanding of the concept behind the hands-on activity. These paired activities can be done in a series to ensure that students have grasped all aspects of a mathematical concept.
- *Think-Pair-Share and other types of structured talking time* are collaborative activities in which students individually consider an issue or problem and then discuss their ideas with a partner. These activities help deepen students' understanding of a concept.

  In Think-Pair-Share, the teacher presents a math problem and divides the class into pairs. Then the teacher poses questions for discussion. These questions should promote higher order thinking (you can find some ideas in our blog post about *mathematical discourse*). During their discussion, students write down ideas and later share those ideas with the rest of the classroom.

  Another type of structured talking time is the "jigsaw" activity. Each student in a group constructs something that depicts their knowledge a set topic. Then they share and discuss what they've done. E.g., when learning multiplication, students can work on different models to illustrate the concept: algebraic, visual, physical/manipulative. As they share the models they've made, they discuss whether each is equally accurate.

  A third example of scaffolding involves selecting a few students' work as models, having each student explain their reasoning, and then having the class devise different ways to arrive at the same answer. This activity emphasizes that it's important to understand the process of math rather than just get the "right answer." When students see multiple ways to do a given math problem, it develops their mathematical thinking. Also, some students have difficulty with particular math procedures; this activity shows them that there are other ways to produce the same answer.
- *Pictures, graphic organizers, and other visual aids* help students better understand math problems and concepts. In addition, when pictures are integrated with math vocabulary (e.g., a slide presentation of vocabulary terms along with a picture and definition), students have an easier time developing fluency in math-specific terminology, conventions, and language.
- *Digital math curriculum programs and websites* often include tools such as videos and interactive games that not only enable students to visualize math concepts, but also allow them to explore those concepts in a fun, nonthreatening way. It will be particularly useful if those programs and websites contain embedded strategies for diverse learners, including English language learners.

Concrete Representational Abstract (CRA)

CRA can be used to introduce new skills or as an intervention. In this three-part strategy, students start to explore math concepts by manipulating concrete items. As they gain understanding, they move on to drawing pictorial representations that mirror their work with the objects. Finally, students translate these models into abstract representations using numbers, notations, and mathematical symbols.

CRA combines behaviorist and constructivist instructional strategies to improve student understanding and retention of math concepts. When students go through these three steps, they shift from conceptual understanding toward procedural accuracy, fluency, and an understanding of math as a multi-faceted process. This process helps them develop a deeper understanding of mathematical concepts and ideas.

The CRA strategy can be used in demonstrations, modeling, guided practice, independent practice, and even assessments. In CRA assessments, when students do not show proficiency at the abstract level, they can demonstrate understanding using concrete objects or through pictorial representations. Teachers can later deliver instruction to help students progress to the abstract level.

Applying Assessments

Many of the strategies mentioned in this guide require an assessment. In fact, some (e.g., reteaching) can't be implemented without first determining what learning gaps a student has. To do this, schools can use conventional diagnostic tests (though not for the usual accountability purposes, of course). Another option for evaluating students' skill levels is the use of instructional programs that have integrated benchmark assessments with *Quantile measures*.

It's a good idea to conduct universal math screening after disruptive incidents such as lengthy school closings. The results can help determine each student's current skill level and the best starting points for instruction.

If the semester is already under way, teachers can use a beginning-of-the-year assessment to determine if students have managed to retain what they'd previously learned. The teacher can then pinpoint where learning loss has occurred and address those gaps.

If it is the beginning of a new school year, teachers will want to gauge students' previous grade knowledge. E.g., if a student is entering fifth grade, they would be assessed on their fourth-grade knowledge. If knowledge gaps are identified, the teacher can address those gaps so that students have a solid foundation before proceeding to on-grade material.

Educators Make Math Meaningful

According to *eSchool News*, "evidence … suggests that without greater emphasis on math instruction and practice, the losses [from school closures] may become permanent." Helping students quickly recover lost math learning requires making the subject meaningful rather than relying on memorization and practice.

The strategies and resources mentioned in this guide point the way to creating meaningful experiences. Inquiry-based math investigations, manipulatives, and interactive games engage students as they build their understanding. Purposeful math discussions boost student collaboration and growth. However, educators remain the core of students' learning experiences. Adjusting to the new, unexpected demands of 2020 and 2021 has been a herculean task for all educators. But with support and armed with the right strategies and resources, they can successfully fight COVID learning loss.

About Accelerate Learning

Accelerate Learning has over 200 practicing teachers who help write curriculum, field test lessons and assessment items, and review and edit all materials to ensure factual accuracy, so our curriculum is current and practical for implementation in any type of classroom.

To learn more about how STEMscopes Math can help you with learning loss strategies, visit: STEMscopes.com/math

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