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What is This?
Monitoring Student Response to Mathematics Intervention: Using Data to Inform Tier 3 Intervention

Stephen Ciullo¹, Danielle SoRelle¹, Sun A. Kim², You-jin Seo³, and Brian R. Bryant¹

Assessment plays an integral role in helping teachers to identify mathematical domains in which students require intensive intervention. Once interventions are implemented, monitoring student progress is essential to determine how students are responding to instruction.

Ongoing assessment of student performance has garnered national attention in the past decade as a result of several educational reform efforts. For example, the No Child Left Behind Act Of 2001 (NCLB; 2002) and the Individuals with Disabilities Education Improvement Act of 2004 (IDEIA; 2004) share some similar reform components. Each reform emphasizes the need for academic...
excellence through identifying struggling students early. Additionally, implementing evidence-based interventions and data-based instructional decision making are hallmarks of modern reform. Early identification of students at risk for mathematical difficulties and the implementation of preventative intervention services show great promise in reducing risk (Bryant et al., 2008; Fuchs et al., 2007). Monitoring of student progress has been an integral part of mathematics assessment for years, including curriculum-based assessments (Fuchs, 2004). Thus, educators must have access to progress-monitoring techniques that can be easily and reliably used to identify students in need of intervention and to determine their response to intensive instruction.

This article describes types of progress-monitoring techniques that mathematics interventionists and special education teachers can implement in classrooms to make informed, data-driven decisions about early mathematics intervention. Although educators may be using some of these assessment types already to inform instruction, this article introduces the most current and comprehensive practices. We first describe four different levels of progress monitoring and then provide information regarding how to create a tracking tool in Excel that can be used to chart progress over time.

### Progress-Monitoring Checks

When examining whether students are responding appropriately to instruction, four levels of progress monitoring (i.e., benchmark checks, daily checks, unit checks, and aim checks) can be implemented. See Table 1 for additional information about how all four progress-monitoring checks can be used.

#### Benchmark Checks

**Benchmark checks** are given to all students to identify the relative standing of students compared to established fall, winter, and spring performance goals. “Benchmark” is a term that has been connected to high-stakes testing and is typically used in both mathematics and reading in most schools. Performance on benchmark checks have been linked to the probability of success on high-stakes tests such as state standardized tests. However, a benchmark can also be a predetermined score (e.g., a test score that

<table>
<thead>
<tr>
<th>Progress monitoring tool</th>
<th>Purpose</th>
<th>Administration</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchmark check</td>
<td>To answer the questions, “Where does the student fall in comparison to his or her peers?” and “Does the student qualify for intervention?”</td>
<td>Benchmark checks are given to all students in the fall, winter, and spring of the year.</td>
<td>Four, 2-minute timed tests assessing number and operation skills (e.g., magnitude comparisons, number sequences, place value, addition/subtraction combinations), which are summed to form a total score.</td>
</tr>
<tr>
<td>Daily check</td>
<td>To answer the question, “Did the student meet the objective of the day’s lesson?”</td>
<td>Daily checks are administered only to students receiving intervention at the end of each day’s lesson.</td>
<td>Several items that assess the content of the lesson. Administered as part of independent practice, the daily check total score should allow for one mistake, yet still achieve mastery (e.g., for a five-item daily check, mastery is set at 80% correct).</td>
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<tr>
<td>Unit check</td>
<td>To answer the questions, “Has the student mastered the content of the unit/chapter as presented across a 2-week (or so) period?” and “Has the student maintained daily learning across an elongated time frame?”</td>
<td>Unit checks are administered only to students receiving intervention at the end of the 2-week intervention unit or chapter.</td>
<td>Ten to 20 items that assess the content taught during the unit/chapter. Tests can be a pregenerated component of the commercial or research intervention, or unit checks can be created using items from the daily checks. With at least 10 items, mastery can be set at 90%.</td>
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<td>Aim checks</td>
<td>To answer the question, “Is the student making progress towards his or her intervention goal?”—which is usually the next benchmark.</td>
<td>Aim checks are administered twice per week to students receiving intervention. Some teachers choose to administer aim checks to all students once every week or 2 weeks.</td>
<td>Aim checks should be alternate forms of benchmark checks. It is best to create four or five forms of the aim checks to ensure that students do not remember answers from a single form.</td>
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</tbody>
</table>
corresponds to the 25th percentile), below which a student qualifies for intervention.

**Daily Checks**

Once students are identified as qualifying for intervention, they are provided daily instruction that concludes with a series of end-of-lesson problems. These *daily checks* are independent practice tasks that align with the intervention and that inform teachers about whether students are meeting the objective of the day’s lesson. Thus, daily checks are administered at the end of each daily lesson and should be designed to take just 1 minute total. All too often students progress through a lesson yet fail to demonstrate an understanding of the skills and concepts. When that occurs consistently, it is highly unlikely that the student will demonstrate progress over time and make adequate strides toward his or her annual academic goal.

**Unit Checks**

Intervention programs vary in duration. In our work, lessons are packaged in 2-week units, and our *unit checks* are similar to end-of-chapter tests in textbooks. Every 2 weeks, students are administered unit checks to identify the extent to which they have mastered the content presented in the unit while maintaining their understanding of skills and concepts demonstrated by daily check results. Occasionally, students demonstrate success on daily checks but are unable to transfer learning over an extended period. When this situation occurs, students are unable to demonstrate mastery of skills and concepts taught across the unit. Our units take 2 weeks to administer, so the unit checks are administered on a biweekly basis. The frequency of administration varies, however, across different curricula. Where do unit checks come from? One option is for teachers or district personnel to create unit checks to cover the material they covered (should correspond with scope and sequence of district and state). However, some textbooks or programs owned by districts may provide a unit test that is appropriate.

**Aim Checks**

*Aim checks* are not administered in all schools and programs, but they are of critical importance. Aim checks are periodic assessments of whether students are making satisfactory progress toward middle-of-the-year or annual goals as assessed by benchmark checks. We conduct aim checks twice a week for Tier 3 students and once a week for Tier 2 students. Performance on aim checks is charted, and decisions are made concerning the success or failure of the intervention. In an aim check, performance is compared to the *aim line* of a progress-monitoring chart. If schools decide to create an aim check, it is important to remember two things. First, the format should closely resemble the visual format of the benchmark checks. Second, the aim check is a tool used to determine how well students are progressing on big ideas as measured by the benchmark checks. For example, if one of the major skills for the year is subtraction of double-digit numbers, then the aim check and the benchmark check would measure that skill.

**Using Excel to Graph Student Progress**

Excel, or any computer spreadsheet program, is an excellent tool to plot aim check performance for each student. The teacher enters the total score for each test or subtest. Once a baseline is established, teachers continue to administer the aim checks (twice a week for Tier 3 students), record and plot scores, and use the resulting visual depiction (from the graphing tool) as a practical way to examine the progress of each student receiving math intervention (see Note 1).

A table can easily be created to monitor students’ progress on the aim check testing. In any spreadsheet program, create a table with seven or eight columns that will allow you to enter the unit number, the aim check form (A–E), and four columns to enter your student's score on each of the four subtests. An example math test might cover magnitude comparisons, number sequences, place value, and addition-subtraction combinations. The last column in your table can be programmed to total all of the subtest scores and get a total score for the aim check test (see Figure 1). This will help track student scores.
on individual skills across time. It is helpful to create an aim line that begins on the score a student earned on his or her initial test in the fall and then passes through the established benchmark scores in the winter and spring. This line will help show how much a student must improve to reach benchmark level for winter and spring testing (see Figure 2).

Summary

Much has been written recently about the need to identify valid early mathematics assessments and conduct progress monitoring to determine whether students are making adequate progress toward performance goals (Fuchs et al., 2007; Lembke, Foegen, Whittaker, & Hampton, 2008). This article described four types of assessment techniques used to identify students requiring intensive, Tier 3 intervention. Benchmark checks universally screen students. Daily checks measure daily performance related to the intervention’s objectives. Unit checks gauge the cumulative learning within units of lessons. Finally, items aligned with the benchmark checks (i.e., aim checks) provide the last piece of the assessment puzzle. For students performing substantially below their peers, frequent monitoring is critical to determine whether they are improving following the additional support.

Individual schools must decide whether to garner student data formally through progress monitoring and whether to use more or fewer than the four checks proposed here.

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Note

1. For additional information regarding creating Excel files to efficiently chart student progress for any of the assessment types mentioned in the article, please contact Daniele SoRelle, Meadows Center for Preventing Educational Risk, College of Education SZB 242E, University of Texas at Austin, 1 University Station D4900, Austin, TX, 78712.

References


About the Authors

Stephen Ciullo is a doctoral candidate in the Special Education Department at the University of Texas at Austin. He also serves as a project coordinator for the Meadows Center for Preventing Educational Risk at the University of Texas. His research interests are reading interventions for middle-grade students, learning disabilities, and response to intervention.

Danielle SoRelle, MPH, lives and works in Austin, Texas. Currently she is a project supervisor in the Institute for Mathematics
Disabilities and Difficulties in the Meadows Center for Preventing Educational Risk at the University of Texas at Austin.

Sun A Kim, PhD, is currently an assistant professor in Graduate Programs in Special Education in the Department of Educational and Community Programs at Queens College, City University of New York. Her research interests include mathematics assessments and interventions for students with diverse learning needs including students with math disability and English language learners.

You-jin Seo, PhD, is a research professor at Korea University. Her research interests include assistive technology and mathematics interventions for students with learning disabilities and instructional adaptations for students with disabilities in inclusive settings.

Brian R. Bryant, PhD, lives and works in Austin, Texas. Currently he is a fellow with the Institute for Mathematics Disabilities and Difficulties in the Meadows Center for Preventing Educational Risk at the University of Texas at Austin.