The Pre-K to Grade 3 Essential Math Skills Inventory

Developing Deep Understanding of Basic Mathematical Concepts

Bob Sornson, Ph.D., Early Learning Foundation

The Pre-K to Grade 3 Essential Math Skills Inventory helps you systematically measure the development of crucial basic math skills, and then respond by giving children learning activities at a level where they can be challenged and still highly successful. It is designed for use with children ages 3 to 9, during the preschool to grade three years, because this is the period in which children have the greatest opportunity to deeply understand and fall in love with math.

Properly using this simple inventory encourages teachers and parents to know exactly which skills kids have developed to a level of deep understanding and application, and which skills still need instruction, practice, activities, projects and/or play. By carefully tracking progress toward essential math skills, we can help almost every child deeply understand the fundamentals of math and vastly increase the number of children who use it joyfully throughout their lives.

For decades, our schools have been engaged in a failed experiment that attempts to cram more content into the time available for instruction than is humanly possible. Most schools have asked children to learn overwhelming content at younger and younger ages without carefully building the foundational skills needed for learning success.

Early childhood is the crucial time during which we build the foundation skills, behaviors, and beliefs which establish our path as a learner for life. Sadly, for many young children our teaching systems are not working effectively. By the beginning of fourth grade, the point at which we can accurately predict long-term learning outcomes, only 40% of American children are at proficient math levels. By eighth grade this has decreased to 35% student proficiency, and by twelfth grade only 26% of students remaining in school performed at or above the proficient level in mathematics (NAEP, 2011, 2009).

The long-term effects of such numbers of American children becoming non-proficient math learners in the information age are a calamity. Low skill learners become low skill workers with low wages. Early learning success in reading and mathematics is correlated with high school graduation, going on for advanced education, better decisions about risky behaviors, decreased criminality, stable relationships and success on the job. The costs of letting three-quarters of our children become non-proficient in math include diminished employment option for our children and reduced prosperity for our society.

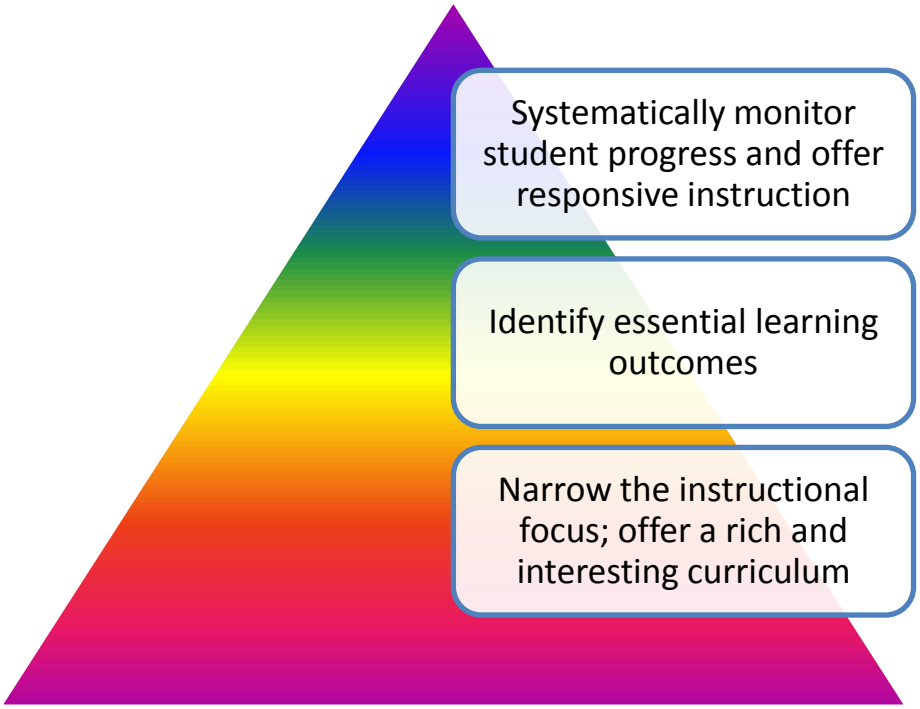
It is time for us to help more of our children develop the numeracy skills that will allow them to succeed in the information economy. *The Pre-K to Grade 3 Essential Math Skills Inventory* supports teachers and parents as we stop racing through math instruction, and take the time to learn the essential outcomes well. This idea is not new.

> The National Council of Teachers of Mathematics recommends that math curriculum should include fewer topics, spending enough time to make sure each is learned in enough depth that it need not be revisited in later grades. That is the approach used in most top-performing nations.
>
> - National Mathematics Advisory Panel, 2008

During the early years of math learning children should be engaged in a rich and interesting set of math learning experiences which include manipulatives, projects, and activities. Much of this early learning should seem like exploration, inquiry, and play. At school teachers are advised to use a math curriculum based on the Common Core State Standards, or on a set of outcomes developed by your state, that serve as a guide for content to cover during the year. But "covering" crucial content is not enough. Some skills need more than coverage. They need high quality instruction, and for some children these skills require re-teaching, more time for practice, different approaches to learning, and more time for activities which help these skills become deeply understood and easy to use in life.

Some math skills are essential to understanding numbers and how they work. These are the skills which might be considered the "core of the core." They must be well understood or a child will be forever compromised as she moves forward into more complex math learning.

The Pre-K to Grade 3 Essential Math Skills Inventory helps you systematically measure what matters most: student learning. It can be used along with any thoughtful math curriculum or learning materials. It allows you to keep track of the skills that have been well-learned, plan instruction for the skills your child is ready to learn, allow all the time needed to help her develop deep understanding, and move her forward as soon as she is ready for the next level of skill. During the crucial early years, we can ensure that student learning needs drive instruction rather than a non-viable curriculum or pacing guide.



With less emphasis on racing through content, we can identify essential learning outcomes and use ongoing formative assessment to keep track of how each student is progressing toward the skills that matter most. We can help children build every foundation skill to a proficient level, help more students love math, and bring more joy back into our classrooms.

The Pre-K to Grade 3 Essential Math Skills Inventory

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(Pre-K) Demonstrates one-to-one correspondence for numbers 1-10, with steps
(Pre-K) Demonstrates one-to-one correspondence for numbers 1-10, with manipulatives
(Pre-K) Adds on/takes away using numbers 1-10, with steps
(Pre-K) Adds on/takes away using numbers 1-10, with manipulatives
(K) Demonstrates counting to 100
(K) Has one-to-one correspondence for numbers 1-30
(K) Understands combinations (to 10)
(K) Recognizes number groups without counting (2-10)
(1) Understands concepts of add on or take away (to 30)
(1) Adds/subtracts single digit problems on paper
(1) Counts objects with accuracy to 100
(1) Replicates visual or movement patterns
(1) Shows a group of objects by number (to 100)
(2) Quickly recognizes number groups (to 100)
(2) Adds/subtracts from a group of objects (to 100)
(2) Adds/subtracts double digit problems on paper
(2) Counts by 2, 3, 4, 5, and 10 using manipulatives
(2) Solves written and oral story problems using the correct operations
(2) Understands/identifies place value to 1,000
(3) Reads and writes numbers to 10,000 in words and numerals
(3) Uses common units of measurement:
- -Length
- -Weight
- -Time
- -Money
- -Temperature

(3) Can add or subtract three digit problems on paper with regrouping
(3) Can round numbers to the 10s
(3) Can round numbers to the 100s
(3) Add and subtract 2 digit numbers mentally
(3) Counts by 5,6,7,8,9,10 using manipulatives
(3) Uses arrays to visually depict multiplication
(3) Recognizes basic fractions
(3) Solves written and oral story problems using the correct operation

The Pre-K to Grade 3 Essential Math Skills Inventory

Student: _____ Teacher: _____ Date: _____

Skill	Not Yet	Intervention	Developing	Proficient
Demonstrates one-to-one correspondence for numbers 1-10, with steps				
Demonstrates one-to-one correspondence for numbers 1-10, with manipulatives				
Adds on using numbers 1-10, with steps				
Adds on using numbers 1-10, with manipulatives				
Demonstrates counting to 100				
Has one-to-one correspondence for numbers 1-30				
Understands combinations (to 10)				
Recognizes number groups without counting (2-10)				
Understands concepts of add on or take away (to 30)				
Adds/subtracts single digit problems on paper				
Counts objects with accuracy to 100				
Replicates visual or movement patterns				
Shows a group of objects by number (to 100)				
Quickly recognizes number groups (to 100)				
Adds/subtracts from a group of objects (to 100)				
Adds/subtracts double digit problems on paper				
Counts by 2, 3, 4, 5, and 10 using manipulatives				
Solves written and oral story problems using the correct operations				
Understands/identifies place value to 1,000				
Reads and writes numbers to 10,000 in words and numerals				
Uses common units of measurement:				
• Length				
• Weight				
• Time				
• Money				
• Temperature				
Can add or subtract three digit problems on paper with regrouping				
Can round numbers to the 10s				
Can round numbers to the 100s				
Add and subtract 2 digit numbers mentally				
Counts by 5,6,7,8,9,10 using manipulatives				
Uses arrays to visually depict multiplication				
Recognizes basic fractions				
Solves written and oral story problems using the correct operation				

Protocol for Use of the *Individual Essential Math Skill Inventory*

The Essential Math Skills Inventory is a simple format for systematically assessing the most crucial skills in the development of early numeracy. The inventory serves as an on-going formative assessment tool, regularly updated by the teacher/parent, so you can identify specifically what students know and what they are ready to learn. These skills are the core of the core (CCSS), and cannot be merely "covered". These are the skills we must ensure students learn to a level of deep understanding and application. These are the foundation skills upon which a lifetime of successful mathematical learning will be built.

1. During the first few weeks of school, use observational, informal and instructional assessment to get to know which skills your student/child has, and which skills are lagging in development.

2. Note proficiency **by writing the date** on the inventory. Student proficiency is noted only after the student has demonstrated this skill at the proficient level on several occasions and using more than one type of instructional material. Be certain that a student deeply understands and can use a skill before certifying proficiency.

3. You may wish to devise a system to remind you of the times when proficient skills were noticed. Some teachers use dots (in pencil) on the inventory to note these observations.

4. Exceptions can be made to the rule of several observations during baseline data collection, but only when teachers/parents use careful observational assessments and are certain a skill is completely proficient.

5. Plan instruction based on this information. Your knowledge regarding which skills this student already has and which ones are developing will help you pick activities and projects which match the child's readiness.

6. Regularly update your Essential Math Skills Inventory as you see the child move from **Intervention** to **Developing** to **Proficient**. Celebrate success.