**Essential Math Skills:**

**Over 250 Activities to Develop Deep Understanding, Pre-K to Grade 3**

**Essential Math Skills** gives you the tools to help you ensure that students learn the crucial early math concepts and skills needed for long term learning success.

◗Identifies the core math skills that must be mastered at each grade level in Pre·K through third grade

◗Provides targeted activities that include the use of manipulatives, activities, exploration, inquiry, and play.

◗Shows many ways to use the **abacus/ counting frame** to build math skills and have fun while learning

◗ Provides tools for systematic measurement of progress toward the essential early math skills



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Author **Bob Sornson**

Bob Sornson, Ph.D., is nationally recognized for developing the Early Learning Success Initiative and works with schools and organizations across the country to support teachers and parents. Dr. Sornson is dedicated to giving every child the opportunity to achieve early learning success, which lays the foundation for success in life. Dr. Sornson is an advocate for programs and practices that support high-quality early childhood education and parent engagement.

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**Essential Math Skills**

Developing Deep Understanding of Basic Mathematical Concepts

Bob Sornson, Ph.D., Early Learning Foundation

*Essential Math Skills* helps you systematically monitor 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.

Use of the activities and inventories encourages teachers and parents to know exactly which skills each child deeply understands, 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 grasp 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 (National Assessment of Educational Progress, 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, lower rates of substance abuse and other risky behaviors, decreased criminality, stable adult relationships and success on the job. The costs of letting three-quarters of our children become non-proficient in math include diminished employment options 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 all the time needed to learn the essential outcomes well.

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 includes the use of manipulatives, projects, and activities. Much of the early math learning experience should be 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 many 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 simply 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: 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**

Bob Sornson, Ph.D., Early Learning Foundation

(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 using numbers 1-10, with steps

(Pre-K) Adds on 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) Counts objects with accuracy to 100

(1) Replicates visual or movement patterns

(1) Understands concepts of add on or take away (to 30)

(1) Adds/subtracts single digit problems on paper

(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

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**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) |  |  |  |  |
| Counts objects with accuracy to 100 |  |  |  |  |
| Replicates visual or movement patterns |  |  |  |  |
| Understands concepts of add on or take away (to 30) |  |  |  |  |
| Adds/subtracts single digit problems on paper |  |  |  |  |
| 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 |  |  |  |  |

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Competency for Essential Pre-K to Grade 3 Math Skills

Let’s help the next generation of children fall in love with math. Learning about numbers and mathematical thinking should be about exploration and inquiry, patterns and play. Consider the following recommendations as you plan your math instruction using **Essential Math Skills** (Shell, 2014) for children in the early grades.

1. Plan instructional activities and projects which the student can do with a high rate of success. Kids work harder and longer, and stay far more engaged, when they are good at the task. Generally students should experience success at least 90 to 95% of the time to stay in the optimal state of mind for effort and learning. Don’t push too fast and cause students to move out of the optimal state of learning.
2. Include movement and manipulatives in your instructional plan. Young children need concrete learning experiences, including those that involve lifting, stepping, carrying, touching, hearing, and seeing. As kids get older, plan instruction that allows them to see the solution to a problem on a manipulative device (abacus, ten-frame, beads, pipe cleaners, etc.) and then write the solution to the problem on paper. Kids need to understand math concepts and the concrete level before they will truly understand them at the symbolic level.
3. Carefully watch each student for engagement, interest, success, or frustration. This is called observational assessment or formative assessment. Use your observations to help you affirm or adjust your instruction. Give each student an opportunity to do math each day which is a little bit challenging but allows a high rate of success.
4. Plan projects and activities, not just the rote practice of math skills. Projects help make math come alive, offering an opportunity to see how math concepts connect to building, digging, drawing, deconstruction, imagining, planning, and working together as a team.
5. The Essential Math Skills Inventory is not a curriculum; it is a tool for systematic measurement of progress toward the essential outcomes. Your curriculum (plan for what to teach and how to teach it) should include much more than the skills on the inventory. Use the Essential Math Skills Inventory in combination with Singapore Math, Saxon Math, Montessori, Waldorf, Math Their Way, Everyday Math, Khan Academy, Kumon, Lightspan, Houghton-Mifflin, Excel, Exploring Math, DreamBox, or any thoughtful math program.
6. Develop clear routines for the delivery of math instruction and learning time, whether you are at school or at home. Routines for getting out materials, working together, working independently, checking work, putting away materials all add to the predictable environment that supports good learning.
7. The standard for proficiency used in the *Essential Math Skills Inventory* is deep understanding of the concept or skill, and the ability to use the skill easily and in many different learning contexts. Take your time. Learning these skills is neither a race nor a contest. The importance of these skills demands that we accept children where they are, give them all the time and encouragement necessary to learn these skills well, and systematically monitor their progress so we can move them along to the next level of challenge as soon as they are fully ready.
8. In many schools teachers have been asked to “cover” more math standards than are humanly possible, treat all kids as if they are at the same level of math skills, and “keep up” with the pacing guide. An educational model that encourages a race for grades, and which sorts students into winners and losers during the crucial early learning years is neither effective nor ethical. We can help almost every student develop deep understanding of the essential math skills. Stand up for your students, and speak up for best practice.

Author’s bio

Bob Sornson, PhD, was a classroom teacher and school administrator for over thirty years and is the founder of the Early Learning Foundation. He is dedicated to helping schools and parents give every child an opportunity to achieve early learning success. His Pre-K to Grade 3 Early Learning Success Initiative has demonstrated that we can help many more children become successful learners for life.

Bob is the author of numerous articles and books, including  *Fanatically Formative, Successful Learning During the Crucial K-3 Years* (Corwin, 2012), *Creating Classrooms Where Teachers Love to Teach* (Love and Logic Press, 2005), *The Juice Box Bully* (Ferne Press, 2010), *Stand in My Shoes: Kids Learning about Empathy* (Love and Logic Press, 2013). To contact Bob or learn more about his publications and workshops, please visit [www.earlylearningfoundation.com](http://www.earlylearningfoundation.com/).