



MEASURE WHAT MATTERS!

Executive Function Skills & Math

By Jenny Yun-Chen Chan, PhD

Executive function skills are important for regulating behaviors, as well as academic success, including math achievement. This relation between executive function skills and math is not surprising when considering the cognitive skills involved in solving mathematical problems. For instance, if you ask 5-year-old Lola to figure out, "How many pets are **three cats** and **four dogs** altogether?", she might impulsively count "3, 4" and then shout out "5!" as her answer. This is an example of reciting an overlearned number sequence. Alternatively, Lola might **pause to think** through the problem, **ignore the differences** between cats and dogs, and then **keep in mind** the number 3 while counting up four more numbers (4, 5, 6, 7).

Research findings indicate a consistent and predictive relation between executive function skills and math abilities for many students^{1,2}. For instance, preschoolers who were better at holding verbal information in mind were also more accurate at comparing and combining numbers³. Furthermore, students' ability to shift attention flexibility during kindergarten as measured by the Minnesota Executive Function Scale Table-top Version, predicted their ability to solve math story problems in first grade⁴.

Because thinking and learning about mathematics often involves executive function skills, math activities may offer opportunities to practice and improve both skillsets simultaneously.

Below are some examples of how parents can support the development of both mathematical and executive function skills in daily activities:

1. Help your child hold Information in mind.

Just like the example of Lola having to remember two different numbers while counting, children must keep relevant information in mind when solving math problems. If your child tries but fails to keep track of all the numbers, you may provide working memory support by suggesting some alternative strategies such as holding up 3 fingers on one hand and 4 fingers on the other hand, then counting all the fingers.

You can also turn daily activities into opportunities to practice working memory. For instance, when packing for a five-day vacation, parents can ask children, "How many shirts, shorts, socks, etc., do we need to pack? Let's try to keep them in mind before we start packing!" If children have difficulty remembering all the items during the packing process, parents can provide hints such as, "We packed 5 shirts and 5 pairs of shorts. What else do you put on when you get ready in the morning?" With older children, parents can help them practice both working memory and arithmetic skills by asking them to keep track of and figure out the total of a grocery bill during grocery shopping.



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2. Remind your child to reflect.

Instead of diving into a problem and shouting out the answer right away, children can learn to pause and think through the problem. One way to support reflective thinking is to encourage children to think quietly before sharing their thoughts. For example, before bringing out the plates for dinner, parents can ask children to predict, "How many plates do we need? Think quietly first, then share your ideas." If children have trouble predicting the number of plates needed, parents can help by prompting, "Count quietly in your head, how many people are here?"

Snack time can also be an opportunity for practice. You can try prompting your child, "We have 12 strawberries in the bowl. Let's think quietly about how we can share these strawberries fairly between you, mommy, and daddy. Then we can share our ideas."

3. Encourage your child to plan ahead.

During planning, children must pause, think through the problem, generate ideas, select a plan of action, and carry out each step. Encouraging children to create and execute a plan may promote reflective thinking as well as planning skills. One idea for practicing this skill is to create a recipe and follow the steps together. For instance, when making a salad, parents can ask questions such as, "How many olives and tomatoes should we put in the salad?" Then parents and children can count the items together.

4. Change Things Up!

Being able to shift attention flexibly is another important aspect of executive function that is often involved in solving math problems. Many daily activities are great opportunities for children to practice both skills. One way to do so is to change up some aspects of these activities. For instance, when playing with Lego pieces, parents can support flexible thinking by first asking children to count all the pieces by shape (e.g., squares, rectangles), then shift their attention by asking them to count all pieces by color (e.g., blue, red). Parents can also support shifting skills while building a tower together, such as making color (e.g., blue, green, blue, green, etc.) and shape (e.g., square, square, rectangle, square, square, rectangle, etc.) patterns with children.

Even if you are not always aware of it, your child is using executive function skills to solve any math problem that is new or challenging. Practicing EF in the context of math games is a great way to build both skills!

Resources

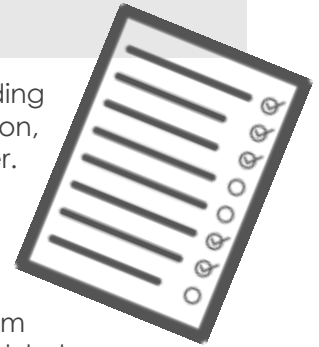
- To learn more about **research on early math education**, please visit: <https://dreme.stanford.edu/>
- For **tips on reading math books** with children, please visit: <https://dreme.stanford.edu/news/10-tips-reading-math-picture-books-young-children>
- For an **app to incorporate math problems in daily life**, please visit: <http://bedtimemath.org/>
- **Games and toys that promote math** talk and learning include: Chutes and Ladders, Legos blocks, and [The Number Race](#).

Welcoming Our Newest Reflection Sciences' Blog & Parent Newsletter Contributor, Marie Lister!



Marie graduated in 2012 with a Masters of Education and a teaching license in Early Childhood and Early Childhood Special Education. She has been a classroom teacher for 9 years and currently is a teacher at the Shirley G. Moore Laboratory School at the University of Minnesota. She has experience designing and implementing Executive Function based interventions, curricula, and professional development trainings. Look for blogs by Marie in the next newsletter!

Social and Emotional Development in Schools: The Effects of a One-Sided Report Card



Traditional report cards measure a student's achievement and progress in specific subjects covered in class, but today, educators are beginning to worry that students are not being prepared for the tests they will face outside of the classroom. These current school reports are too focused on academic achievement, ignoring social and emotional development, including self-control, perspective-taking, and conflict resolution skills.

The consequences of underdeveloped social and emotional skills are no less serious than facing a generation that is not taught how to read. The most effective education focuses on academic as well as social and emotional development to properly prepare a student to be successful both in school and in life.

How Do We Measure Social and Emotional Development?

Currently there is no applied method of assessing a child's social and emotional development on a national level. The ability to be productive, to problem solve, to connect with others, or to take criticism is difficult to measure by a letter grade. However, report cards usually include comments from a child's teacher regarding behavior, motivation, participation, etc. This method is often time consuming, biased, and unreliable.

What can we do differently?

Add SEL "Grades" to Report Cards

Some schools have taken affirmative action in making social and emotional learning (SEL) a part of their formal grading system. The George Lucas Educational Foundation, for example, has implemented a guide for educators explaining how to integrate SEL, as well as tips on how to communicate these scores both with parents and on paper. Similarly, the Character Lab offers a Character Growth Card. Further research on the validity of these approaches is needed.

If integrating SEL into the grading system is not currently an option, there are alternatives to consider. One possibility is to engage educators and students with social emotional activities, in which they are presented with situations that assess their problem solving, stress levels, ability to seek help, social awareness, etc. This option also keeps teachers actively involved in SEL with their students.

Employ Executive Function Exercises

Another option is to engage students in executive function and self-regulation exercises. Students are not born with these skills, but they do possess the ability to learn to plan, multi-task, and focus. Encouraging EF development is highly dependent on both teachers and parents; they need to establish routines and set an example for model behavior and supportive relationships. Establishing these competencies in early childhood supports self-control, enables positive choices, and helps set the right course for SEL.

Assessing a student based on more than their ability to retain academic material is key to encouraging a well-rounded, productive, and successful future. For example, a student who is good at math but lacks the confidence to handle stressful or challenging situations is likely to face issues in his or her ability to be a team player, or handle larger workloads in the future. Such students may struggle at home, at work, or anywhere in between. This does not mean to say that we should do away with the letter-grading system entirely. Middle and high schools offer such varied curriculum that letter grades are necessary, and grade point averages are essential when applying to college. However, if we are adamant about adding SEL to the curriculum in our primary education system, we are building a foundation for students to be successful throughout their lives.