MATH INTERACTIVE LEARNING EXPERIENCE

Parent Guide

MILE







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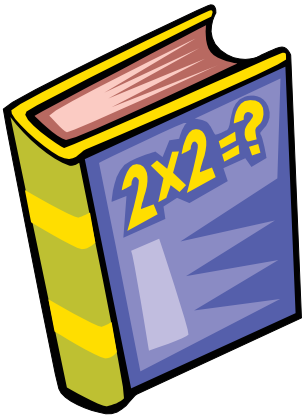
Introduction

Past research has shown that children with FASD do poorly in math. In an attempt to help increase math skills in children who were prenatally exposed to alcohol, the Math Interactive Learning Experience (MILE) program was developed. This math program utilizes an active/interactive approach to learning, combined with a hands-on method of tackling math problems.



One of the causes for poor math skills may be weak visual-spatial skills. Children with FASD have been found to have difficulty understanding visual and spatial relationships between objects and themselves. Therefore, the MILE program teaches math concepts by using real objects rather than worksheets. This enhances visual-spatial skills improving math skills.

This manual has been designed to help you understand how math develops in children, and to aid you in helping your child learn math by making it a part of everyday life. Real objects and everyday experiences are part of the program to help your child turn math into something that happens all through the day, rather than only in school.

Section 1 of this manual presents a general overview of the MILE program and introduces the Focus-and-plan, Act, Reflect (F-A-R) strategy to help children learn. Section 2 discusses the roles of the student, the MILE instructor and the caregiver in the process of helping the child increase math skills. Section 3 shows caregivers how to set up a work space at home and the types of everyday objects that can be used to support math learning. Sections 4, 5, and 6 discuss how math typically develops in children, the neurodevelopmental problems that may hamper this development, and strategies that can be used to overcome those problems. Section 7 provides suggestions on how caregivers can help their child learn through the interactive learning style, followed by a sample dialog of an interactive learning math session.

Section 1—Overview of the Math Interactive Learning Experience (MILE) Program

The Mile Program

You and your child will participate in the MILE program to help improve his or her math skills through the use of hands-on activities.

Children learn best when they talk or think about the activities they are doing. Using hands-on materials (manipulatives) encourages them to explore the world. This exploration helps them create a picture of the math concepts in their heads. When seeing math concepts in action your child is more likely to understand the concepts.

The MILE program utilizes a metacognitive teaching style. This means that students are encouraged to think about **what** they are doing, **how** they are doing it, and **why**. This helps them to learn how to solve mathematical problems, which will improve their overall problem solving skills.

The MILE math program teaches focusing and reflecting skills through the F-A-R strategy. This approach was influenced by the teaching style used in the High Scope classroom curriculum, and by the work of cognitive psychologist Reuven Feuerstein. F-A-R stands for: **F**ocus and plan–**A**ct-**R**eflect, and teaches the child to answer the questions: "What is I going to do and why?" "How am I going to do it?" and "What did I do?" and "Did I do what I was planning to do?" This type of focusing and reflecting helps the child to make connections between events and supports the development of cognition (thinking skills) and metacognition (thinking about what you "did in your head".)

In addition to the F-A-R strategy, the essential ingredients of the MILE program are:

- **Choice.** Within the context of the learning situation, the child is allowed to make some choices.
- **Materials.** There are several materials (manipulatives) that children can use in many ways.
- **Manipulation.** Children are encouraged to freely manipulate the teaching materials.
- **Language from the child.** Through the use of careful questioning, the child is encouraged to describe what he or she is doing.
- **Adult Support.** Adults encourage children's intentions, reflections, problem solving, and creativity through mediation and prompting.

The F-A-R Strategy

F-A-R - Focus-and-plan

During Focus-and-plan time the student is helped to focus his/her attention on the work to be done, and then formulate a plan to work on the math goal for the day.

Making a plan involves:

- Establishing a problem or goal
- Deciding on what to do first, next, and last
- Imagining and anticipating actions
- Expressing personal intentions and interests
- Shaping intentions into purpose
- Thinking
- Making ongoing changes

How do children benefit from Focus-and-plan?

This process:

- Promotes their self-esteem and sense of control
- Leads to involvement and concentration on play/task
- Supports the development of increasingly complex abilities
- Teaches them how to plan

F-A-R - Act

During the Act phase of F-A-R, the child:

- Does the planned activity
- Plays/works with purpose
- Participates in the activity
- Solves problems

During this time children are developing important intellectual, as well as social, emotional, language and physical skills

What is the benefit of Act time for the child?

Doing the activities:

- Encourages playfulness
- Helps the child to build upon knowledge as he/she works
- Helps adults to observe, learn from, and support children's play/work
- Helps children develop vocabulary and insight

During the activity, the MILE instructor also applies the F-A-R strategy. In other words, while the child is engaged in the math activity, the instructor encourages planning and reflecting within the task. This is done through questions like: "What do you need to do next?", "Tell me why you did that?", "How did you get that answer?"

F-A-R - Reflect

Reflect time is the part of the process where the student will think about the work/play activity and evaluate what worked and what did not work. This is an important time for interactive learning questions to assist in insight and retention of the work done (see Section 7).

During this time the child:

- Remembers and thinks about actions and experiences
- Thinks about the plans, actions and outcomes and how they tie together (makes connections between events)
- Talks about the experiences

How do children benefit from Reflect time?

The process of reflecting, or thinking back:

- Helps the student to form and talk about mental images
- Helps the student to think beyond the present
- Increases the ability to talk about past events
- Enhances understanding of the completed activity
- Strengthens recall and memory
- Helps children to construct/learn knowledge as they work
- Creates insight into their own thinking processes
- Helps adults to observe, learn from, and support children's play

Section 2—The Roles of the Student, the Instructor, and the Caregiver

The Student

As children explore the world they find many things to learn about. When they do this they are active learners, and are playing an important part in their own learning. An interested child will explore, discover and make observations. This interest leads to involvement and motivation, which form the basis for actively constructing knowledge.

What will my child do as an active learner?

As an active learner the child will:

- Choose an activity within the context of the MILE goals set by the MILE instructor, or within the context of the activities planned at home.
- Choose materials to work with
- Explore actively with all senses particularly sight, touch, and hearing
- Discover relationships through active experiences (holding, touching, moving, and talking about)
- Work with materials found in everyday experiences
- Talk about the learning experience
- Lead the conversation about the math activity during Reflect time

The Instructor

During the MILE session the instructor teaches the activity or lesson that was chosen based on the MILE math goals that were developed to help your child increase math skills. Through active interaction the instructor matches your child's readiness, needs and interests with the activities, using hands-on instruction according to the F-A-R model. He/she also assists your child to explore and to think about math concepts, and supports your child by being positive and by providing opportunities to be successful. The goal is to help your child develop awareness, insight, and understanding of numbers, rather than rote learning of math facts.

The Caregiver

You and your child's instructor will work together to develop your child's math skills. You will play an active role in assisting your child at home to practice the skill taught during the session.

At the beginning of each MILE session you, your child and the instructor review the previous week's math work you and your child did at home. At the end of each session, you receive a Parent-sheet, as well as the Math-Activity-sheet the instructor used for the session. The Math-Activity-sheet also shows a number of F-A-R questions that you can ask when you help your child to Focus and plan, do the activity (Act), and Reflect afterwards.

The Parent-Sheet gives suggestions how you can support the math activity that was done during the session. By carrying on the math concepts taught during the session and by giving your child opportunities to practice the new skills, you help to solidify the learning that took place.

When you work on math activities with your child it is important to have a quiet place away from disruptions such as television or toys. Section 3 gives suggestions about how to set up a work space at home and what materials you can use. As you will see, there is no need to go out and buy expensive materials. You can base the math activities you do with your child on the Math-Activity and Parent- sheets. A very important aspect of this work at home is that it should be FUN for your child. So don't try to do math-drills or use flash cards. To help you feel more comfortable about working with your child, you could arrange with your child's instructor to sit in on the MILE sessions. This way you can observe how the math is presented and how your child is allowed to manipulate the materials to solve the math problems.

Following is a list of other important things you can do during your work at home with your child:

- Form a partnership with your child
- Sit down with your child, don't hover over him/her
- Ask your child to make a plan before starting the activity
- Approve of your children's choices and actions
- Seek out your child's ideas
- Encourage your child to discuss the materials to be used to carry out the plan
- Encourage your child to solve problems or complete tasks
- Watch what your child does with materials

- Use materials in the same way your child is using them
- Talk with your child about what he/she is doing or thinking
- Make comments that repeat, amplify, and build on what your child says
- Encourage your child to do things for himself/herself
- Encourage your child to ask and answer his/her own questions

When working with your child you want as much as possible to elicit ideas and to encourage understanding of the math problem. You can use the F-A-R questions on the Math-Activity sheet. The way you ask your questions is very important. You will need to keep in mind at all times that your child is still in the process of **learning** a skill. That means he/she **does not know it yet**. Therefore do not quiz your child or give the impression that you require the "right answer". You are merely **guiding** your child to **discover** the correct answer. Section 7 discusses Questioning in more detail.

Math really is FUN! You and your child will learn to recognize that math is not only something you do in school or during a tutoring session. It is present in all areas of life, for instance counting cars when driving and then determining if you saw more blue cars than red cars = Math. And "Let's set the table, how many plates do we need?" = Math.

Other "math activities" include such things as:

- Dinner (If we have four people, how many sets of utensils do we need?)
- Planning weekend activities (What shall we do first, next, last?)
- A party for a birthday or other occasion: count the number of candles, count number of party hats needed for each guest, count number of chairs needed for each guest, discuss the shapes of the cake, party hats, gift boxes
- Baking cookies: what needs to be done first, second, third and so on, how many steps are involved, how many ingredients, measurement of the ingredients, amount of ingredients, guess how long it will take to bake them, shape of cookies
- Doing laundry: sort the colors into separate sets by color, type, measuring how much detergent to put in, estimating how long it will take to wash the clothes.

From the above you can see that you have a very important role to play in the success of the MILE program. If you have any questions about what you can do, never hesitate to ask your child's MILE instructor.

Section 3—Setting up the Work Space and Materials

How Should I Set Up The Work Area At Home?

The learning space should be set up so that your child can work as independently as possible. You need to eliminate as many distractions as possible – no TV, and no toys or electronic games hanging around! It is best to work with your child at the same time and in the same place every day, so that he/she comes to expect the activity. This is important because it gives your child a sense of being able to predict what is going to happen. It also makes the activity part of the "plan for the day." Be positive about this **special time** you will have together and ask your child to set up the work space with you.

Here are some characteristics of the work area and materials that will be helpful:

- Preferably, the work space should be large enough so that the math materials you use will not be cluttered, and easily accessible. A cleared off dining room table or desk works fine.
- You can use everyday household objects or home-made materials to cut expenses (some suggestions follow below).
- Containers and materials should be clearly labeled so that your child knows exactly where they are to be stored or put back. One idea for labeling is that you could use a photo or box top label with the word marked clearly next to the item.
- Store the math materials within view or low enough for your child to see and easily get.
- The picture below (compliments of www.do2learn.com) shows an example of a work area set up.

Where Can I Find "Storage Items" That are Not Costly?

Here are some examples of storage items:

- Packing boxes
- Empty boxes – grocery, shoeboxes
- Containers – oatmeal, coffee tins, Crisco, gallon of milk boxes
- Dishpans
- Baskets
- Silverware trays
- Plastic jars – school lunchrooms
- Clothespins
- Containers for sorting (pie plates, egg cartons, microwave trays)

Where Can I Find "Active Learning Materials" That are Not Costly?

There are many things that we automatically throw away that can be used to help your child understand math.

For instance:

- Bottle caps (counting, categorizing & patterning)
- Food containers (boxes, comparing shapes, paste and cover the shapes, categorize, measure)
- Newspaper (folding, finding certain number patterns, shapes)
- Magazines, catalogues (finding patterns, shapes, comparing symmetry)
- Outdated calendars
- Toilet paper rolls, paper towel roles (shapes, symmetry)
- Buttons (categorization, comparison, counting)
- Margarine containers (storage, use to make a circle)
- Egg cartons (sorting, containers)
- Microwave containers (trays for sorting)

Another great source for inexpensive materials is dollar stores. There are many items in those stores that can be used for math activities such as counting, sorting, patterning and adding or subtracting. Use your imagination and think outside the box!

Section 4—Math Development and the MILE Curriculum

The MILE Math Curriculum is a program of active and constructive learning, based on the math domains of the Georgia Performance Standards and influenced by the High Scope Program and the work of cognitive psychologist Reuven Feuerstein. The program avoids the use of rote memorization of math facts and worksheets, because rote memorizing is not the most helpful way to learn math, especially for children with FASD.

Math Development

Math development is an ongoing process that does not start with being able to recite addition-facts and times tables. The process starts at the pre-school level and involves gaining an understanding of such concepts as, for instance, classification and ordinality. In order to do well in math the child needs to have a solid foundation of early math concepts. The five areas below describe those early, underlying, math concepts

Classification

Classification involves putting objects in groups that go together based on some category such as likeness or difference. Initially children learn to sort or organize objects by color or size. As the child develops understanding more criteria such as shape, size, texture, and function can be added to sort. For example: sort blocks according to size **and** color **and** shape, "Put all the big, red, rectangular blocks in this pile".

Ordinality

Ordinality refers to the order of objects in relation to other objects. Thus the young child develops an understanding of such concepts of 'first, next, last', 'heavy, heavier, heaviest' and 'which one is the shortest?', or 'who has the most?' This evolves into understanding a number line and an understanding of the sequencing of numbers.

Verbal Labels

Children learn various words to describe quantity, intensity, and size. They learn the words that go with certain concepts, for instance the names of the numbers, and words to describe quantities such as: many, few, more, and less. Children may learn to recite numbers in a sequence, but this does not mean they are true counters. However, it is an early developmental phase to learn names and the correct order of numbers.

One to One Correspondence

True counting occurs when children understand one to one correspondence. This means that they have developed the understanding that when counting each object gets only one 'number name'. Associated with this is the concept of cardinality. Cardinality has to do with the quantity that each number represents – in other words, how many objects there are. A child has developed true understanding of numbers and counting when he/she can count for instance, five objects by pointing at each on separately and then tell you there are five, without having to recount.

Conservation

Conservation has been developed when the child can recognize that things stay the same, even though the presentation may look different. For instance, five pennies bunched together are the same as five pennies stretched out in a long line. Or, a cup of water poured into a narrow, tall glass stays the same amount when it is poured into a wide flat bowl. Also, a square does not become a triangle when it is rotated with one of the corners on top, and a ball of play-doh still has the same quantity when it is flattened into a pancake.

Examples of Activities to Learn Each Math Concept

The following are some suggested activities you may try with your child in order to help establish the math concepts.

Math Concept	Goal	Description	Activities
Classification	Learning about relationships	Color, size, shape, function, texture	Children may group objects according to one feature and then another
Ordering	Learning to sequence objects or events based on an underlying quantity	Shades of color, magnitude of height, weight, length, or total mass, or any other feature that varies in amount or intensity	Sequencing blocks according to size, completing pattern activities such as X O X O… (what comes next?)

Math Concept	Goal	Description	Activities
One to one correspondence	Learning that every item in a set gets one and only one number value. This is true counting	Understanding that it does not matter what objects are counted is a precursor step to assigning a unique number label to each item in a set to be counted. Each object gets a number value. In other words, it does not matter if the child counts 5 cows or 5 marbles, there are 5 objects in each set	Beginning activities include: • Matching identical objects • Later activities should involve matching mixed objects. Match one fork to each plate and so on • Have the child move, touch or point to an object as he/she says the number words
Conservation	Important for the learning of later numerical reasoning	The amount (or quantity) of objects stays the same regardless of the way they are arranged	Have the child pour the same amount of water into a tall, thin glass then a low wide glass and ask if they are the same. If the answer is yes, the child understands
Verbal Labels	Learning to attach verbal labels to different amounts or quantities	Learning number names and various words to describe quantity, intensity, and size	Have your child put household items into groups and explain the relationship using words such as more, less, most, bigger, smallest, darkest or brightest

Steps in Learning to Count

Learning to count is one of the most basic math concepts a child needs to develop. Just reciting the numbers or 'singing the number song' is not real counting, although it is a very important first step. To truly understand math, one must understand that numbers represent a quantity that gets increasingly higher as the number goes up. Numbers are used in everyday life including school.

The basic rules that underlie the ability to count effectively are as follows:

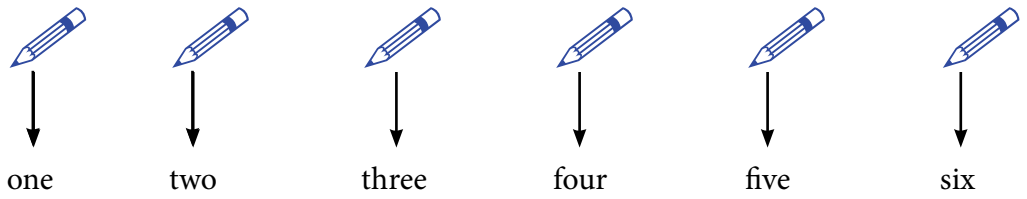
- Stable order
- One-to-one correspondence
- Cardinality
- Counting Independent of Order and Spacing

Stable Order

The order of the words must be the same across counted sets. Many young children do not yet know the standard sequence of number words that is, "one, two, three."

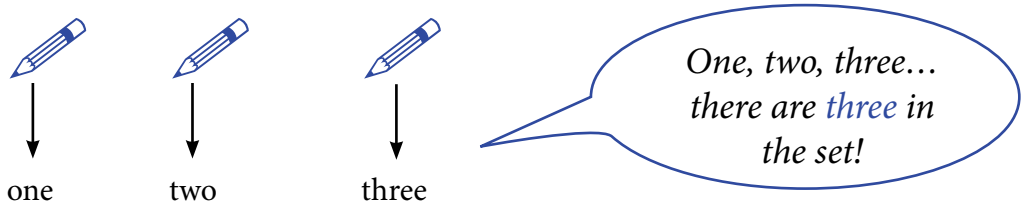
One-to-One Correspondence

This means one and only one word (e.g., "one," "two") is assigned to each counted object. Counting the same item twice and tagging/naming the item, ("one, two") is not one-one correspondence.



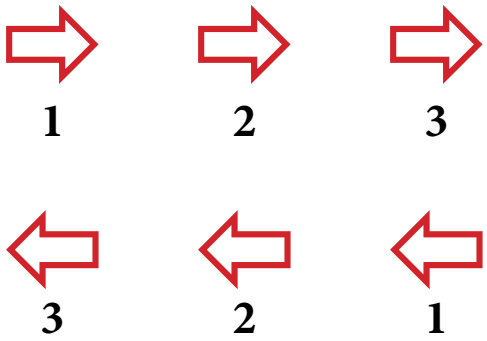
Cardinality

The quantity of items in the counted set is represented by the final word. One way to test this knowledge is to ask your child to count a series of objects and then ask them "how many are there?" You know your child understands cardinality if he/she will just repeat the last number word. (e.g., "three" if 3 objects were counted). If they recount the set then they do not fully understand this concept.



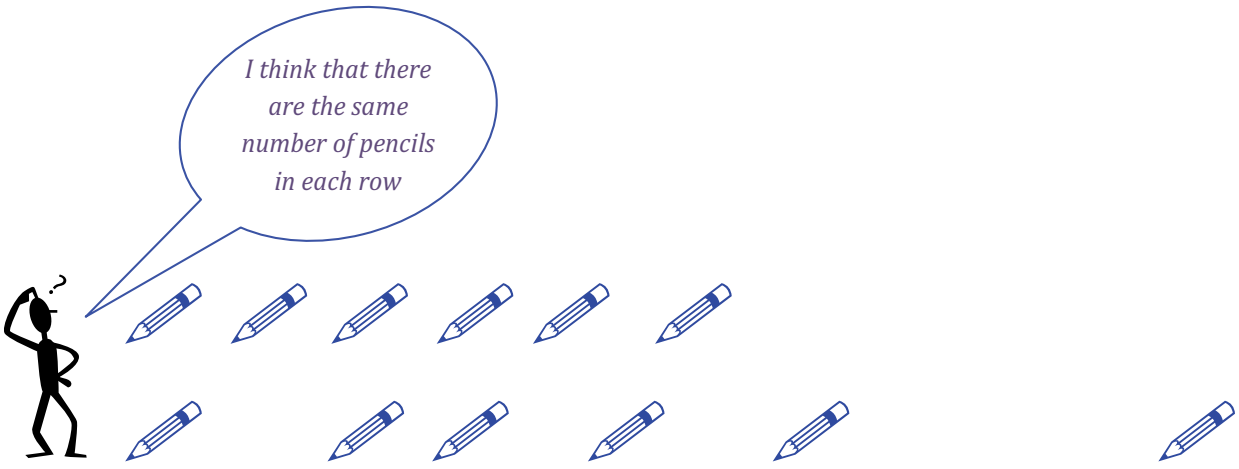
Counting Independent of Order and Spacing

A child needs to understand that a given set can be counted in any sequence (from left to right, from right to left, or skipped around).



You will know if your child fully understands counting if he/she understands that it is O.K., to count objects out of order as long as each item is counted only once.

If your child has a complete understanding of number concepts, your child will be able to know that a collection of objects is the same, regardless the physical appearance of the objects or set of objects. That is, the amount of 9 is the same whether there are nine horses, or nine people, or nine cars. As well, 6 pencils remain 6 pencils, whether they are bunched together or spread out far apart.



MILE Curriculum

In order to help children develop the concepts discussed above and to develop an understanding of higher order math concepts, the MILE curriculum focuses on four different math domains: 1) Number and Operations; 2) Measurement; 3) Geometry; and 4) Data analysis. Within each domain there are different areas of focus; each area of focus has different developmental levels.

Your child's instructor will work at your child's developmental level. Therefore, even though your child may be in second, third or fourth grade, the work done in the sessions may focus on math exercises done in earlier grades. The reason for this is that a solid foundation in understanding math concepts benefits your child more than drilling materials that are not understood.

The different areas of focus of the MILE program within the domains are as follows:

Number and Operations

- Sorting
- Patterns
- Counting
- Ordering
- Number line
- Addition
- Subtraction
- Regrouping
- Multiplication
- Division
- Fractions

Measurement

- Height/Length/Weight
- Time

Geometry

- Shapes
- Patterns

Data Analysis

- Graphs
- Metacognitive Understanding

Section 5—Neurodevelopmental Problems That Impact Math Learning

This section examines the underlying cognitive deficits associated with FAS and FASD. (Strategies for remediation in each of these areas will be discussed in Section 6)

Understanding math concepts and operations involves an understanding of brain functioning, or how a person thinks. The following areas of brain functioning have been identified as being crucial to developing good math skills:

- General Learning Ability
- Working Memory
- Visual-Spatial Ability
- Graphomotor Skills

Each of these areas is discussed below.

General Learning Ability

Often children with FASD have cognitive impairments that slow down their rate of learning. However, this does not necessarily mean that they are unable to learn at all! It just means that learning may be slower. Here are some important guidelines to help your child's general learning as well as, specifically, math learning:

- The curriculum should be developmentally appropriate. In other words, if your child can do first grade math but is in third grade, he/she should be working on first grade math and work towards second grade math!
- Your child has to be actively involved in his/her learning.
- Your child needs to be able to explore, experiment, talk about, and move around materials to help with the learning process.
- Skills in math should be practiced over and over again, since there is evidence that the rate of understanding can be improved with practice.

Learning should be fun. Math skills can be taught in almost any situation, such as games, driving in a car, cooking, art, music and rhythm. These are all fun activities that can help strengthen math skills.

Working Memory

Working memory refers to the amount of information that you can hold and manipulate in your mind at one time. It has been referred to as your mental notepad. If you recite your telephone number you will be using your memory retrieval skills (long term memory). However, if you recite your telephone number backwards you will be using your working memory skills. This is because you have to hold the numbers as they are in the correct sequence, and then manipulate them to start from the final number and work towards the first number.

Long-term memory can be thought of as a file cabinet in your head where you store important pieces of information. You have to put new information into this file cabinet (encode), and obtain old information (retrieve) when you need it. Working memory affects both the ability to encode, and to organize and retrieve information

Children with FASD often have difficulties with working memory but may seem to understand what is presented in class. They may be able to complete some of the assignment. However, the next day or even by that afternoon, these same children may not remember what was discussed. They appear to do well in the beginning of learning a new skill but forget what they learn in a short time. Often you may hear reports that the child was not paying attention or that the child is just careless. This is most often not true and may cause frustration and anger in the child. They simply cannot remember or recall the information.

Working memory weakness has an impact on the ability to learn math concepts because this type of memory is important to:

- Be able to apply strategies to math problems
- Be able to hold the information or task involved with the math problem while working on each step ("*for this math problem, I need to look at the sign to know whether to add or subtract, then I need to….next I need to …*", and so on)
- Remember what part of the math problem is being worked on ("*am I adding the first column or the second?*")
- Remember what computation he or she is doing ("*am I doing addition or subtraction*?")
- Be able to copy problems from the board onto paper

Problems in working memory cause:

- Difficulty copying numbers or problems from a book or chalkboard
- Problems remembering visual images long enough to write them down on paper. This can be frustrating and slow - which will lead to errors
- Frustration with the use of a calculator if children cannot see the whole problem. They may have to check back to the problem several times because they can't remember it long enough to put into the calculator
- Difficulty retaining math facts
- Forgetting steps in math rules, formulas
- Difficulty with reviewing lessons or mixed test formats

Visual-Spatial Ability

Math is a subject where being able to see and understand spatial relationships is very important. One of the first fundamental math concepts is the knowledge of size, quantity, magnitude, and/or intensity of various features of objects. If a child has deficits in this area, then all future math development may be compromised. Furthermore, visual-spatial deficits may make it difficult to recognize symbols used to represent numbers or mathematical operations (+, x, -, =). It will also affect the child's ability to line up columns to do advanced addition, subtraction, and multiplication.

Visual-spatial ability is important in math development and is needed for your child to:

- Be able to put what they see into an idea
- Recognize, as well as describe, different shapes, sizes and positions of objects that are one, two, and three-dimensional
- Express understanding of math on paper
- Accurately plan the use of space on paper. Poor visual-spatial ability may result in mistakes and/or messy homework
- Recognize color, form, shape, pattern, size, and position

If your child has a visual–spatial deficit the following difficulties may be noticed in the math area:

- Understanding time-related (temporal) expressions like "in 5 minutes," or "7 minutes ago," he was here earlier," or "see you later"
- Lose place on the worksheet
- Differentiating between:
- Numbers (e.g., 6 and 9; 23 and 32, or 21 and 12)
  - Distorted images or mirror images
  - Coins
  - Operation symbols
  - Clock hands
- Writing across a paper in a straight line
- Understanding directional aspects of math, for example, in problems involving:
- Up-down (addition) and working from right to left when doing vertical number problems
- Aligning of numbers – keeping them straight or even
- Using a number line (vertical number lines are easier to read/understand)

Graphomotor Skills

Some children with FASD have difficulty using what they see (visual cues) to guide movement, both in gross motor and fine motor tasks. They may also have difficulty understanding their place in relation to objects and surroundings. Furthermore, they may have difficulties with learning and remembering the sequence of muscle movements needed in writing numbers. The reason for these difficulties is that the areas of the brain that guide the sequence of motor movements are often affected by prenatal exposure to alcohol. Thus, writing to express ideas is a frustrating task, and what is more, the task of writing may cause interference with the learning process.

Suspect a graphomotor problem in your child when you see:

- Writing fatigue
- Writing that is hard to read, sloppy or messy
- Organization is poor on a given line or page
- Numbers and letters or words are scrunched together/crowded
- Numbers cannot be written neatly with normal, lined paper

The next section discusses some strategies you can use to help your child overcome the deficits in working memory, visual spatial ability, and graphomotor skills.

Section 6—Strategies to Help Overcome Neurodevelopmental Problems that Impact Math Learning

The previous section discussed the specific areas that are weak in many children with FASD, namely working memory, visual-spatial ability, and graphomotor skills. This section presents some strategies that can be used to help students overcome the weaknesses and thus strengthen their math abilities.

Working Memory

Your child needs specific training in ways to help to "jog" his/her memory and should have memory aids available until the ability to use certain strategies to "jog" the memory is learned. Following are some suggestions for strategies that can serve as memory aids.

- **Mnemonics.**
  A mnemonic is simply a strategy that helps you remember something. For example, a rhyme or a song about something such as 'one two, buckle my shoe; three, four, close the door …." to remember the sequence of the numbers.

- **Presentation of smaller chunks of information.**
  Working memory is greatly taxed when an instruction consists of more than two or three pieces of information. For instance when you want to your child to get the math book, flip to page 10 and do the first three problems, it will be best to present this instruction as follows: "Please get your math book" (wait a few seconds), "find page 10" (wait a few seconds), "do questions 1, 2 and 3"

- **Flip charts (or other visual guides for certain rules and symbols).**
  Write down the information that needs to be learned and hang the chart in a place where your child can easily see it. Or, make picture charts with the sequence of events that your child can use.

- **Presenting facts and other information to music or using rhythm.**
  Use familiar songs such as Twinkle, twinkle little star, or If you're happy and you know it, and make up your own words to fit the fact you want to teach your child.

- **Cues may help your child find or remember the information that was learned.**
  Cues can be verbal, such as giving the child the first letter of the word you want him/her to say. You can also give a cue by simply pointing at, for instance the plus or minus sign when your child is doing a math problem.

- **Repetition, practice and over-learning when learning new skills.**
  Even when it appears that your child "gets it", it is a good idea to continue with the same instruction for a little while longer until you are satisfied it is there to stay.

- **Review and rehearse steps for solving a problem frequently.**
  In many cases, new information pushes out earlier learned information. It is therefore important to review earlier learning regularly.

- **Association.**
  One of the best ways to memorize something is to associate it with a visual image. This image can be anything, as long as it makes sense to the person who tries to remember. For example, 6 is an elephant with its head held high and its trunk up. 9 is monkey tail down. Other ideas for associating visual images with numbers (be creative and make up your own to make them appropriate for your child): 1 = candle, 2 = swan, 3 = two donut halves, 4 = sailboat, 5 = curtain hook, 7 = boomerang, 8 = snowman, 0 = football.

When working with your child you will need to keep in mind that he/she will need time for recall/remembering. Always use the *TEN-SECOND-RULE*. That is: count to ten before you move on with a new question or supply the answer yourself!

Another, very important way to help your child overcome problems with memory is to help him/her become aware of his/her own thinking processes so that he/she can be in control of the process and make connections. This way *Thinking* can become a strategy to figure out things rather than rote-memorizing separate, seemingly unconnected blocks of information. Helping your child to become aware how he/she figured out an answer to a math problem can be done by a special way of questioning which is discussed in Section 7.

In order to remember facts it is important to know which aspects of a problem are relevant (and need to be remembered) and which aspects are not (and can be ignored). Many children with FASD have difficulties with distinguishing between relevant and irrelevant information. You can help your student by showing him/her that with every problem three questions need to be answered:

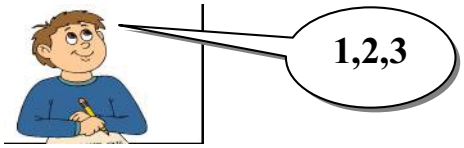
1. What do I need to do here?
2. What information do I need so I can do it?
3. Where in this problem/page is the information I need?

Using a highlighter to mark the relevant information is helpful.

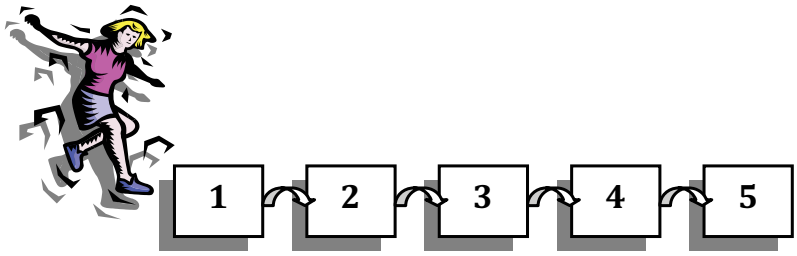
Activities to Strengthen Working Memory

Following are some activities you can do with your child to help develop his/her working memory:

- **Be a teacher.** Let your child write or review the steps learned with another person to "teach" them.
- **Meaningful events.** Make learning math meaningful by providing specific examples that are directly tied to your child's experiences and interests.
- **Make mental images.** Have your child make a picture in his/her mind about a math topic or number. For example, a mental picture of a large whale. Then have your child make a mental picture of a little cow or horse next to the whale. Ask questions about the mental picture. Which is the largest animal? Which is smaller? This helps the child improve his/her use of imagery. It also helps the child to talk about what is seen in the mind.



- **Role-play or acting.** Role-playing or acting is a way to enhance memory because your child actually acts out the event. Let your child "buy" items using money, pretend (role play) he/she is teaching a TV audience how to count or add or recognize shapes.
- **Jump the Numbers.** Draw numbers with chalk on the sidewalk and have the child jump the numbers in this number line.



- **Flash cards.** It should be noted that flash cards should not be used when first teaching a concept to your child. This method should be used only after your child has mastered facts using tools, rehearsal, role-play, self-talk and other multisensory strategies. Use the cards only for practice and maintenance.

Visual-Spatial skills

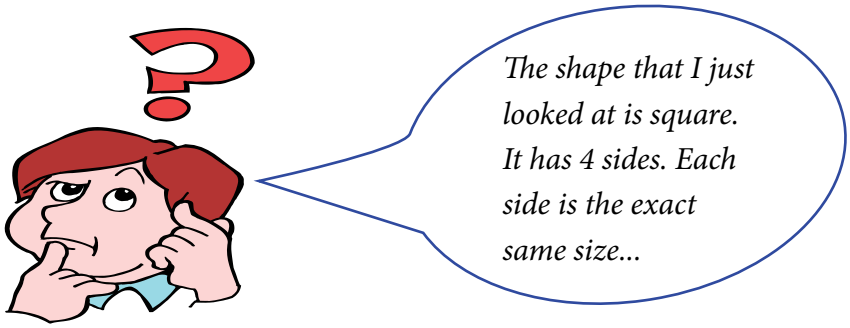
Developing visual-spatial skills involves interacting with objects, and discussing and describing what is seen and done. Following are some strategies and activities you can utilize to help your child strengthen this important skill.

- **Manipulate.**
  Make repeated use of concrete teaching examples (for instance, blocks, chips, various counting devices, and visual number lines). Use materials that can be felt, seen, and moved around in space.

- **Talk about the object they are using.**
  For example, if the child is holding a square he/she should be instructed to say "this is a block, it has four sides." "All the sides look the same size." The child can then draw the square and say, "this block has four connected lines."

- **Learn verbal skills.**
  A goal for your child would be to help him/her to learn strong verbal skills for qualities of objects and events (i.e., talking about the description of the object, what it looks like, and how it can be used, and talking through the steps in a math problem).

Using verbal explanations are helpful when your child has difficulty with spatial concepts. Spatial problems may cause pictures and diagrams to be confusing; talking it through allows another part of the brain to assist in making sense out of the stimulus.



- **Use color coded math.**
  Highlighting, for instance all the plus signs in yellow and all the minus signs in blue adds a visual dimensions to a math page. So, before starting on the problems help your child to find all the pluses and all the minuses and mark them with a highlighter.

- **Add more structure to paper.**
  Make lines bolder, larger or darker; use raised-lined paper; use paper that is sectioned/divided into larger and more notable sections; turn note book paper sideways to write; use graph paper.

Graphomotor Skills

Graphomotor skills can be developed by encouraging the child to utilize both fine and gross motor movements. Specific multisensory techniques that encourage children to *verbalize* the motor sequences of forms of numbers are recommended, for instance the Handwriting Without Tears© program. Tools that can be used to develop motor skills are models, stencils, dashed-lined shapes on paper that can be copied, lined paper turned sideways, and chalkboards or white-board.

Activities

Following are some activities you can do with your child to increase graphomotor skills.

- **Air writing.**
  This helps develop a more efficient *motor memory* for the sequence of steps necessary in making each number. Air writing causes your child to use more muscles than with writing with a pencil.

- **Big air writing.**
  Have the child air-write the number so big that they have to take a few steps to the right and left to complete it.

- **Sidewalk writing.**
  Child writes numbers on a sidewalk as big as they can, *while verbalizing what they are doing*.
  This will allow for more body movement.

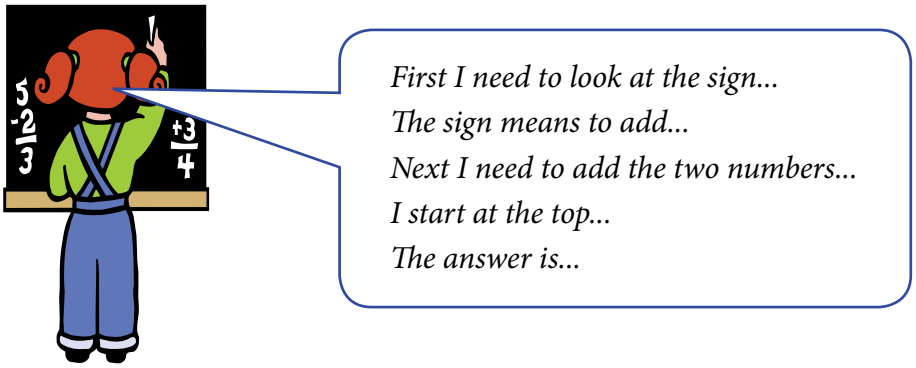
- **Sand writing.**
  Writing in the sand or dirt is another way for your child to use more muscles.

Self-monitoring or Self-awareness

In order to develop math skills in general and the skills discussed above in particular it is important that your child learns to monitor his/her own actions. Self-monitoring is a very important strategy for your child and can be defined as the way that your child knows how he/she is doing in math. Math involves many concepts to learn. Being able to pay attention to the concepts is needed for better understanding and self monitoring focuses this attention.

A way to self-monitor is use self-talk. This is a way to help your child learn by "talking out" and processing the steps of a problem. When your child "talks through" math steps and rules, he/she is using a strategy to help to overcome the difficulties due to the visual–spatial and graphomotor weakness. It will also help in the development of working memory because through the self-talk the child organizes the information that needs to be held while working on the problem.

This child is using the strategy of self-talk.



This child is using the strategy of self-talk.

Section 7—How to Help Your Child Learn Through Interactive Learning

Overview

In order to help you help your child learn we have included this section on Interactive Learning to give you a bit more background on this teaching style, which is used in the MILE F-A-R approach. Interactive Learning is a teaching style that has been successful in increasing cognitive (thinking and learning) functioning in children

Learning occurs best in the following situations:

- The child is presented with the material
- His/her attention is guided towards the relevant elements
- He/she is allowed to manipulate, talk about and be actively involved with the material, and
- Is helped to recognize his/her own thinking processes ("How did you do that?")

The goal of teaching is to create independent, active, lifelong learners and although there are many approaches to teaching and theories of learning, one variable remains constant: there has to be a "teacher" – another human being. Learning is at all times, a social event and does not take place in a vacuum.

At first it will be the caregiver who teaches the child by "explaining" the world around them. A lot of teaching goes on in everyday interactions between a caregiver and a child. As an example of this kind of informal teaching, following is a little scenario of a parent who discusses license plates with the child. The text in blue indicates what is happening within the situation that makes it a teaching/learning event. These types of interactions teach the child more than factual information, in this case about license plates. The child learns underlying, pre-academic skills such as to attend, to focus, and to make connections between events. It is often assumed that these underlying skills "just happen", whereas in fact they are taught through the thousands of everyday interactions between the child and the people around him/her.

- **Drawing attention to** ("Look at the white car.")
- **Focusing** ("Look at the license plate.")
- **Naming/labeling the event** ("It is a Florida license plate.")

- Interpreting ("That means the car is from Florida.")
- Reinforcing ("Oh look, a red truck. It is from Florida too. How can you tell?)
- Making connections ("Remember, just like the white car we saw before. Maybe we will see another Florida license plate when we get to the store.)
- Questioning ("Look over there. Where is that green car from? How can you tell?)
- Applying the event to other situations ("What state do we live in?)

These are very natural interactions and happen all the time. As the child gets older, more people, such as teachers, take on the role of "interpreting and explaining the world". Typically, as the child develops, this interpretation becomes more and more infrequent and distant, and by the time he/she is in high school, very little is needed. Generally, by this time a person can learn from just having abstract material presented to them.

- These types of interactions with caregivers and/or teachers are very important for developing cognitive and learning skills. For many different reasons (physiological and/or social), a child may not have received or been exposed to sufficient interactions with adults and this will impact his/her cognitive skills. All children learn differently and at different speeds, and some children need to be told and shown more often than others before they learn something. Those children need more extensive and/or intense interaction in order to learn, than other children. **Children with FASD need a great deal more** because of the neurological damage caused by the prenatal alcohol exposure.

Important Factors in Interactive Learning

Some factors are necessary before an adult-child interaction results in true learning:

- You have to **intend** to teach something. (You need to set a goal for the learning)
- The child needs to **respond**. (You need to have the child's attention and the child needs to interact with you)
- You have to **relate** the subject to other things. (This teaches the child to make connections)
- It has to be interesting and **meaningful** to the child. (Who is going to learn and remember boring, uninteresting stuff?)

You are aiming to help your child learn to think about his/her own thinking. This is called "metacognition". When your child is able to recognize his/her own mental processes it becomes easier to figure out new things. Once you can figure out things, you don't have to memorize so many things anymore!

You can help your child learn metacognition by:

- **Focusing** (helping the child to direct his/her attention to that which is relevant in a situation.)
- **Explaining** (helping the child to make sense out of things that are happening)
- **Questioning** (guiding the child towards insight in what his/her "brain is doing")

Questioning

The way you question your child is important. The correct way of questioning helps your child to organize his/her thoughts because you are guiding him/her towards insight into his/her own thought processes. Therefore questions should be *process-oriented* and not right-wrong or yes-no questions. Process-oriented questions are open-ended like: "How are you going to do that?" or "What materials do you need to build that castle?" When you ask yes-no questions like "Do you want to do this?" or "Do you want to use these markers?" you will get a 'yes' or a 'no' and nothing else! Open-ended questions encourage the child to think about the steps of the plan, organize his/her thoughts, or figure out how he/she derived at an answer. These types of questions also help the child to expand his/her vocabulary.

When you ask questions, be **non-judgmental**. You are trying to get the child to have insight into his/her own thinking process. Questioning should never be used to make a point that could make the child feel bad about him/herself. So, be aware of the tone of voice you use when you ask your questions.

Justification is required for *all answers*, right or wrong! Most people are 'programmed' so that when questioned, they assume they probably answered wrong. Therefore, when you ask for justification of a correct answer you need to preface the question with "good answer, how did you know that was the right answer?" Initially you will have to model the reply, because more than likely you will get a variant of "I don't know!" Explain to the child what they "did in their brain" to come up with the right answer.

When the child gives a wrong answer you might respond with: "Can you think of another way?" or "Let's check to see if that works". When a child gives a wrong answer and then corrects it, you might respond with: "Nice move. Why is this a better answer than that one?"

Some examples of questions you could ask:

- What do you need to do next?
- Tell me how you did that?
- What do you think would happen if …..?
- When have you done something like this before …..?
- How do you feel if ……?
- Yes, that's right. How did you know it was right?
- When is another time you need to …..?
- How can you find out?
- What do you think the problem is? (or: What do you think we need to do here?)
- Can you think of another way we could do this?
- Why is this one better than that one?
- Where have you done that before to solve a problem?
- Let's make a plan so we don't miss anything.

The next section gives an example of how questioning is used in an interactive learning dialog in a math session.

Appendix—Example of an Interactive Learning Dialog During a Math Lesson

Note
This is an **example** of an Interactive Learning Dialog, **NOT** a script. The interaction described below is "ideal" and is an indication for you how to question and what to focus on. You probably will not get such a clear cut response, but it will give you a direction.

Teacher or Parent	We are going to play sorting these objects. Do you know what sorting means?
Child	No.
Teacher or Parent	Well, sorting means when you have a lot of different things all in a pile, you take the things that are the same and you put them in little piles. So when you have one big messy pile, you organize it by sorting the different things in the messy pile. You pick them out and put them in little piles, or in baskets. Understand?
Child	Yes.
Teacher or Parent	OK, let's see what we can do with this pile here. What do we have here?
Child	A pile of macaroni and buttons.
Teacher or Parent	Good, do you see anything else?
Child	Shells and bottle caps.

Teacher or Parent	OK. So what are we going to do?
Child	We are going to take all the macaroni pieces and put them in one pile.
Teacher or Parent	Yes, we are going to sort out this big pile into smaller piles. But before we start, let's make a plan. Why do you think we need to make a plan first?
Child	I don't know.
Teacher or Parent	We are going to make a plan so we know exactly what we will have to do first, second and next. Can you think of a time when you made a plan?
Child	Yes, we made a plan when I had my birthday party.
Teacher or Parent	That is a fun thing to plan for. How did you do that?
Child	We needed to buy a cake and invite all my friends.
Teacher or Parent	And you made a plan so you would not forget to invite anyone or buy some yummy stuff right?
Child	Right.
Teacher or Parent	So, now we are going to make a plan how to sort these things, so we don't forget anything. Where shall we put the things we sort?
Child	Here in these baskets.
Teacher or Parent	Good, what would you like to sort first? And Second?
Child	First the shells and then the macaroni.
Teacher or Parent	OK, how many different things do we have to sort?
Child	I don't know.
Teacher or Parent	Let's look and count.

Child	(looks at objects and counts) 4
Teacher or Parent	Very good, we have four different things can you name them?
Child	Macaroni, shells, buttons and bottle caps.
Teacher or Parent	OK. How many baskets do we need?
Child	Four.
Teacher or Parent	Well, sounds like we have a good plan. You said you want to start with the shells and then the macaroni. Go ahead.
Child	(Child does activity)
Teacher or Parent	Tell me what you are doing.
Child	I am taking all the shells out of this pile first and put them in this basket. Now I am taking out the macaronis and put them in that basket.
Teacher or Parent	Very good, you took out all the shells and all the macaronis. What is left?.
Child	Buttons and bottle caps. I will put them in those two baskets.
Teacher or Parent	All right. That's the next part of our plan. I would like you to tell me exactly what you are doing. Just kind of think out loud.
Child	(Child sorts the rest speaking as he/she sorts).
Teacher or Parent	All sorted. Which one was the easiest to sort?
Child	The buttons.
Teacher or Parent	Why?
Child	Because there was nothing else left in the pile.

Teacher or Parent	Exactly, it started out with a big messy pile and after you sorted it out, the last pile was so easy to do. Do you know another time when you have a big messy pile of something that needs to be sorted?
Child	Sometimes my toys are all over the room and it looks messy.
Teacher or Parent	Then what do you do?
Child	My mom says to clean it up.
Teacher or Parent	And how do you clean it up?
Child	I take all my books and I put them on the shelf and all my legos go in the box.
Teacher or Parent	So you are sorting your toys right?
Child	Yes.
Teacher or Parent	OK, let's see how many of each we have in each basket. What do we have to do to find out?
Child	Count. (child counts) We have 6 buttons, 5 shells, 10 macaronis and 7 bottle caps.
Teacher or Parent	Good counting. I wrote it down so we don't forget. Which basket has the most?
Child	Macaronis
Teacher or Parent	Very good, there are 10 macaronis. Which one has the least?
Child	Shells.
Teacher or Parent	OK. Now, let's look at these things again. You sorted all the different objects. Is there maybe another way we could sort these?
Child	No.

Teacher or Parent	Let's not be too fast. Let's really look carefully. You put all the things in one basket that were the same. This one is all bottle caps, this one is all macaronis, this one is all shells and this one is all buttons. Let's take this button and this bottle cap. How are they the same?
Child	They are both round.
Teacher or Parent	Yes, they are both round so they have the same …..?
Child	Shape.
Teacher or Parent	Good, so could you organize these objects by shape?
Child	Yes.
Teacher or Parent	Let's look at this shell and this button. How are they the same?
Child	They are both white.
Teacher or Parent	They are both white, so they are the same ……?
Child	Color.
Teacher or Parent	Good. So we have another category, color. Now I am going to ask you a difficult question. I want you to really think about this one. Look at this shell and this bottle cap. How are these the same?
Child	I don't know. They are a different shape and a different color.
Teacher or Parent	Exactly, they look very different. Is there something that might be the same? Here, feel them.
Child	They both have sharp edges.
Teacher or Parent	When you looked at them, they looked different, but when you felt them, you noticed something the same. You touched them and that gave you some more information. Sometimes only looking at something is not enough. Sometimes you also have to…

Child	Feel it?
Teacher or Parent	Right, can you think of another way you can get information?
Child	I don't know.
Teacher or Parent	(Points at ears) Sometimes you have to _____?
Child	Listen.
Teacher or Parent	Very good. You can look and feel and listen to get information. You could even smell or taste right? What did you do to decide that the shell and the button were both white?
Child	I looked at them.
Teacher or Parent	Yes. And what did you do to decide that the bottle cap and the shell both had sharp edges?
Child	I felt them.
Teacher or Parent	OK. Let's get back to sorting. So how do you think we can sort these objects in another manner?
Child	By shape, or by the way they feel or by color.
Teacher or Parent	Very good, how would you like to resort these?
Child	I am going to sort them by shape. I will put everything that is round together. The macaronis are round so I will put them with the buttons and the bottle caps.
Teacher or Parent	Good thinking. How many piles do you have now?
Child	Two. I have the shells in one pile and all the rest in another.
Teacher or Parent	OK, let's see how many are in each pile.
Child	(child counts)
Teacher or Parent	Excellent. Let's now look at what you did.

Child	I sorted a big pile into smaller piles of different things
Teacher or Parent	How did you know what to put in each group?
Child	I looked and put everything that was the same in each group.
Teacher or Parent	Great, and then what did you do?
Child	Then we sorted differently and I put everything that was round together. .
Teacher or Parent	What did you do to decide that the object was round? Listen, look, feel or smell?
Child	I looked
Teacher or Parent	You explained very nicely what you did. It is important to explain things clearly. Do you know why?
Child	So I can tell my mom and she knows what I did.
Teacher or Parent	Yes, she will enjoy knowing what you did. She will be so proud. Can you think of something your mom or dad sorts at home?
Child	Yes, my mom sorts the laundry.
Teacher or Parent	Why do you think she does that?
Child	Everything needs to be washed separately so the colors don't run.
Teacher or Parent	Very good. We are finished. You did a great job, you followed the plan we talked about at the beginning and we got everything done. What did you learn?
Child	I learned to sort bottle caps and macaroni.
Teacher or Parent	Yes you learned to sort these things. How can you use what you learned about sorting at home?
Child	I can sort all my books and my toys.

Teacher or Parent	Great, let's sort these one more time to put them away. All the shells go in this plastic bag and the macaroni's in that one. I will put the bottle caps and the buttons in these baggies.
Child	(child helps putting things away).
Teacher or Parent	Thank you, you are a great helper. I will see you next week and we will play and learn some more. During the week I would like you to practice sorting things with you mom and dad. OK?
Child	OK.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