

First Grade Study Groups Deepen Math Learning

Marie W. Sloane

The first grade classroom is abuzz with the sounds teachers love to hear: children engrossed in conversation about what comes next in a number sequence, talking to themselves as they solve problems, letting out excited yells as their pieces get closer to the finish in an addition and subtraction game.

Productive activity is everywhere. Children are talking, thinking, figuring things out, and, best of all, enjoying learning. The teacher does a quick check to see if anyone needs assistance and then sits down with one child. The girl asks, "Mrs. Wells, can I do the shape thing too? Next I want to join that group."



Experts say that good mathematics instruction engages all students as active learners (NAEYC & NCTM 2002). It begins with their current skills and builds new knowledge that is meaningful and appropriate for each child (Baroody 1998). Children construct fuller, deeper understandings of math rather than simply absorbing information put in front of them (Kamii & Housman 2000; Kamii 2003; Leinwand & Fleischman 2004). Effective math instruction allows children to develop positive attitudes toward math instead of negative ones (Clements, Sarama, & Dibiase 2004).

Many teachers agree that these are worthy goals but may run into difficulty achieving them when they are pressured to cover mandated curricula and produce high test scores. Fortunately a number of approaches support meaningful math instruction. One method, math study groups, allows flexible, small groupings of children to study particular skills or concepts. The format provides opportunities for hands-on exploration, skill development in meaningful contexts, and practice for important basic skills. Study groups add supplemental learning opportunities to fundamental teacher-led instruction.

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How do math study groups work?

Study groups meet in class during math work time, with children gathering in small clusters to focus on specific goals or activities. For example, several students may use blocks to explore the concept of multiplication, while some children play a counting game involving money and their other classmates complete written math assignments. The number of groups and their composition and focus change over time. Children may finish some activities and join other groups, change or expand interests, or suggest new problem topics. Groups can become larger or smaller as more children participate and others return to polish skills or pursue a new activity.

Similar to the way reading/writing workshops function, the math study group format acknowledges children's individual readiness to learn skills, recognizes that needs are met at different times, and confirms that the best learning takes place when children work on activities that challenge them appropriately. Not every child participates in every group, as activities and topics vary by skill level. Instead, the teacher helps children select groups that fit their interests and are suitable matches for each child's developmental stage.

Math Study Groups . . .

supplement or extend children's math learning

engage children in problem solving or math skill practice

comprise small groups of three to five children, a child choosing a group with the help of the teacher

meet concurrently within the time frame of regular math class, on a workable recurring schedule set by the teacher

vary in focus by topic, activity, and children's skill levels or needs

last different lengths of time, with some groups short term and changing in activity and others repeating a topic but with new participants

start up as the teacher develops ideas to meet children's needs and as children learn to work semi-independently

The start-up process

Teachers can start math groups at any time, creating one or two groups and gradually adding more as children get used to the idea of working together to problem solve. Eventually, several groups may meet at the same time. However much time is available for math study groups to meet, the process is the same in creating and maintaining groups. The teacher

1. identifies big ideas from the math curriculum and creates activities to explore them;
2. assesses each student's current knowledge and skill level (see "First Grade Math Development Checklist Format," p. 4);
3. considers how many and what types of groups to start;
4. holds individual conferences to help each child select an appropriate group (see "Conferencing with Children to Select Math Study Groups," p. 6);
5. facilitates group meetings; and
6. observes and documents what children learn from their participation in each study group (see "Documenting Children's Learning in Math Study Groups," p. 8).

Big ideas

Math study groups are organized by topic. A teacher may begin by looking at the math curriculum or established learning standards or considering children's questions or expressed interest in solving a math problem. Many math curricula are organized around big ideas that characterize content appropriate for a given age group.

First grade math curricula, for example, generally include topics such as reading and writing numbers to 1,000, solving addition and subtraction problems, and exploring three-dimensional shapes. Each child is expected to master these math concepts sometime during the school year. Although a few ideas are sequential, many can be studied any time a child is ready. To create a quick summary of math curriculum concepts that can serve as study group topics, the



teacher can make a chart of the big ideas.

The next step is to find or think of ideas for how the children can work together on these concepts and skills, starting with one or two topics from the early lessons in the math curriculum. Books of math games and other resources often provide suggestions for group activities. For example, for the core concept *number sense*, children can explore ways to characterize the size/scale of different numbers. While taking part in a “27 Is Not 72” group activity, children can use classroom materials to create sets of 27 and 72 small objects, like counters or paper clips, or by completing sets of activities, like jumping up and down 27 times and then 72 times, making comparisons as they go along (see “Math Study Group Activities for Number Sense,” p. 5).

Assessment

First-graders differ in their understandings of and knowledge about math concepts. For example, several may have a good sense of numbers beyond 1,000, while others get confused as soon as they go past 20.

One important objective in math study groups is to challenge children with activities that require the use of skills and concepts they are ready to learn. To do this, a teacher needs to know what each child already understands and is able to do. She begins by observing and taking notes on students’ current work in lessons from standard math series. Who is flying through the early lessons? Who is confused right away? Who can explain a concept to another child who is confused?

In addition to using regular observations, a teacher may benefit from having a math curriculum that includes a useful set of assessment resources, like *Everyday Mathematics: Teacher’s Assessment Assistant, Grade 1* (2004). Results of these assessments help the teacher develop a more complete picture of each child’s math knowledge and skill. Without these resources, a teacher may create performance-based assessments that ask children to solve problems and answer questions based on the curriculum content (see Guskey 2003).

Types of groups

With topic ideas and assessment results in place, math study groups can be formed. The teacher considers several questions: What activities will work best at the start? How many groups should there be? Which students will be involved at first?

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First Grade Math Development Checklist Format

(sample page)

Performance-based assessments, unlike standardized tests designed to compare large groups of children, provide information specific to each child that teachers can use in planning instruction. Many teachers create a computer database to organize assessment information. Other teachers find that checklists work as well.

Student's name: _____

Whole numbers

Math skills levels

Performance

Counts orally

1 through 100

100 through 1,000

by 2s, 5s, and 10s

using ordinal numbers

estimating numbers

rounding numbers

Reads numbers

1 through 100

100 through 1,000

greater than 1,000

Writes numbers

1 through 100

100 through 1,000

greater than 1,000

by 2s, 5s, 10s

after the one given (on a worksheet)

before the one given (on a worksheet)

using number words

using ordinal numbers

Understands the place value of

two-digit numbers

three-digit numbers

four-digit numbers

Performance key:

+ = mastered already (school year start)

DS = developing skill (add date)

SM = skill mastered (add date)

Math Study Group Activities for Number Sense

The following activities are samples of suggestions teachers can pose to children in a study group focused on numbers up to 100.

27 Is Not 72. Numbers 27 and 72 are very different. Look around the classroom for things you can collect into sets of 27 and 72. How are the sets different?

Big and Small Numbers. Numbers like 89 are a lot bigger than ones like 15. Try hopping in sets of 89 and 15 hops. Try jumping in sets of 75 and 6 jumps. How do you feel afterward?

Greater and Less Than. Complete a worksheet of number pairs, showing whether the first number in each pair is greater than ($>$), less than ($<$), or equal with ($=$) the second number. Switch papers with another member of the group and check each other's work. Discuss any answers that are different.

Estimations Boxes. Collect four sets of objects from around the classroom. Get lots of some items and a few of others. Count each set and put its objects into a separate plastic box (remember to write down how many items each set has!). Now take the four boxes around to your classmates and have each person estimate how many things are in each box.

Every class is unique in its group dynamics: some children are used to working semi-independently in small groups, others will need supervision to get started. The children's ages and maturity levels influence the number of groups that can meet at one time without class disruption.

Other considerations include the amount of time a teacher can devote to designing and documenting study group activities. The teacher may begin with two study groups of five children each, focusing on a skill or activity and meeting on alternate days. She can then rotate different students through the study groups and coach them in the skills they will need to work well together. As more children gain experience, more groups may be formed and meet concurrently.

Group selection

Who will participate in which study group? With study group ideas and collected documentation of each child's work in hand, the teacher meets briefly with individual children. They discuss which math concepts each child has been learning, which she

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needs more practice in, and what she is interested in trying next.

Study group activities need to provide appropriate challenges, focusing on concepts or skills the participants have not yet mastered but are ready to learn. Picking a group with too difficult or too easy an activity wastes a child's time. Within these limits, the child chooses which group to join. The compositions of math groups change regularly, and the flexible nature of groups keeps them from developing any stigma, such as for "children who are smart at math" or "children who aren't smart at math."

Conferencing with Children to Select Math Study Groups

While first-graders are engaged in activities, Mrs. Wells uses the time for individual conferences with children. She sits down to talk with Jordan.

Mrs. W: Jordan, I see you just completed two automaticity study groups to practice your addition facts. Do you want to continue on this topic, or are you ready to try something different?

Jordan: Yeah, I'm getting some of those addition problems, but I saw Steve and Derek playing the Allowance Game the other day. Can I do that too?

Mrs. W: Sure, money is one area you have not worked on yet.

Mrs. Wells notes Jordan's interests and records his mastery of some addition facts. She adds his name to her list for joining the Allowance Game group.

Next Mrs. Wells sits down with Meg, who does not have any idea what math activity she wants to do next. After reviewing the chart of Meg's recent work, Mrs. Wells offers a couple of suggestions, both of which Meg rejects.

Mrs. W: Well, Meg, let's see how you can set a new math goal. We can start by looking over the list of things you have mastered and skills you have not yet learned to see what you might want to tackle next.

Meg: What's this? This vol-um thing?

Mrs. W: That says "volume," and it has to do with figuring out how much space things take up. It is a part of learning measurement. Several other children have not yet worked on this. How about joining a measuring group? We could ask around and see who else is interested.

Meg agrees, and later Mrs. Wells finds three other students to join the group.

Children rotate from group to group to explore topics they have not yet mastered. Some group topics may repeat as different children join or others return for more practice, introductions to new concepts, or additional skills development. The teacher also gives children opportunities to take on different roles within a group. At times, children benefit from being experts and helping others learn. For example, in a multiplication group a couple of children with a well-developed understanding could aid beginners in using blocks to uncover the concept of multiplication.

Group dynamics

How does the classroom teacher manage several groups? Ideally each group will work on different activities and meet at the same time, while remaining class members complete other individual assignments. The teacher can develop a system for keeping track of group compositions.

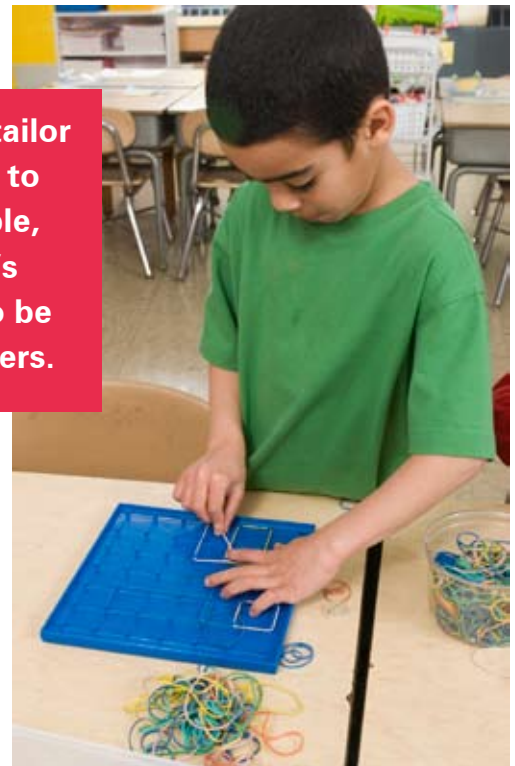
Teachers need to tailor their expectations to what is manageable, based on children's ages and ability to be self-directed learners. Parent volunteers can offer valuable support during study group times, meeting with individual groups or circulating

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around the room and helping children with their assignments.

To help each group along, a teacher can gather children's thoughts on their group's processes (see "Children's Evaluations of the Group Process," p7).

After a group has met a few times, participants can share their thinking about what is going well and what needs improvement. The teacher can help the children discuss these issues and then use their feedback to improve the group's work. If a behavior problem occurs, the teacher can help the children identify the problem and brainstorm possible solutions. Coaching individual children, when necessary, on how to use appropriate behavior is also part of the teaching-learning process.



To help the groups to function semi-independently, the teacher thinks ahead, developing new ideas to engage group members. Even a multitalented early childhood educator cannot be in four places at once. She selects activities like games and puzzles that are interesting and challenging but not so difficult that they require constant assistance (see Kaye 1988 and Yeatts 2000 for ideas on math games).

Children's Evaluations of the Group Process

Name _____

Math study group _____

How well do you think the members of your group work together?

_____ great! _____ mostly OK _____ could be better

Do other children in your group— *(circle your answer)*

listen when others talk?	YES	NO
argue about what to do or how to do it?	YES	NO
discuss what to do or how to do it?	YES	NO
take turns?	YES	NO
share materials?	YES	NO
help each other figure things out?	YES	NO

Write a few ideas on how your group could work better together.

Observation and documentation

With exciting math learning taking place each day, how does a teacher keep track of, record, and share the outcomes with families and others? Any time children are not doing the same thing at the same time in the same way, teachers need methods to document individual learning (Project Zero & Reggio Children 2001).

In the opening vignette, Mrs. Wells moves through the classroom during study group time, watching, listening, and asking “How did you know...?” questions. She looks for evidence that a child is developing or has mastered a certain math skill. She records the date a child works on or accomplishes a particular goal. On individual checklists Mrs. Wells keeps current information on each child’s progress. During conferences, collected information helps her guide children’s next choices.

Documentation allows the teacher to share children’s accomplishments with their families and other important stake-

holders, such as principals and school board members. Mrs. Wells photographs the children working in each group. She posts photos around the classroom and regularly includes new ones in the class newsletter, with short descriptions of the children’s study group learning. These displays spark visitors’ interest and help her answer the perennial question, What do the children do all day?

When a child makes a particularly exciting math discovery, she captures it in a photo, which she sends home with the teaser, “Ask _____ to tell you about this.” This gives parents a good conversation starter.

Math study groups generate valuable portfolio information and work samples of a child’s learning and progress throughout the year (Grace & Shores 1998). Some math groups automatically produce paper records. Many math puzzles and problems, for example, are most easily solved on paper and are ready additions to portfolios. Teachers can use photos and other short forms to document activities. At the start of the year, first grade children may dictate answers about what they are learning, but later they can complete brief forms themselves.

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The cycle of study groups

And so the cycle goes! The teacher periodically starts new math study groups and maintains others through the year, with changing compositions of children—even some repeating. Some groups end when a specific activity is completed

or the teacher senses that the children are ready to move on. New conferences take place, and the children join different groups with new topics. Children get better at working together.

Each child begins to build a sense of him- or herself as a math learner. The conference process gets easier as children see examples of different activities going on around them and make better decisions about their next group choice. Enthusiasm for math learning pervades study group time. And with all the teacher has put into math study groups, the reward is great—children's accomplishments and positive attitudes toward math.

Documenting Children's Learning in Math Study Groups

As children complete their experiences in a math study group, the teacher briefly meets with them individually, helping each child think through what she or he has learned in the group. Early in the school year the teacher may write the children's words, while later they can do it themselves.

What I am learning in my math study group

My name _____

Math study group topic _____

Activities my math study group did.

New math techniques I learned.

Problem solving I can do now that I couldn't do before.

What skills I want to work on in my next group.

New math group interests I have now.

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