

Components and Features in *We Discover Math*

We Discover Math has three core elements: *Classroom Calendar*, *Teacher Guide*, and *Memory Book*. The developers feel strongly that the fewer pieces, the more manageable the implementation. The focus remains on the quality mathematics to which students are being introduced.

CLASSROOM CALENDAR PROGRAM

This element has three components: the *Calendar*, the *Five Frame* and the *Weather Graph*. Each of these serves as a context for ongoing work with numbers, especially the benchmark number five. All of these elements are introduced in Unit 1: Five Comes Alive in Activities 4, 5, and 6. The pace at which these components are put into place should be determined by individual classrooms, based on the previous experiences of students and their developmental readiness. In some classrooms all the components will be in place after Unit 2. In others, it may not happen until Unit 5. Either or any pace is acceptable. Activity 1 in Unit 6 is set in place to review all the calendar components. Use this activity as a benchmark for when the entirety of the Classroom Calendar should be in place. If it is not, delay this activity until the appropriate time.



The Calendar component is an ongoing centerpiece because it provides an avenue for students to explore numbers, number relationships, and patterns. According to NCTM's Principles and Standards for School Mathematics, an additional focus should be on building the concept of time and the ways it can be measured. The classroom calendar uses an entire month as a backdrop, while a movable Focus Week Frame highlights on one week at a time, an appropriate length for a pre-K student.

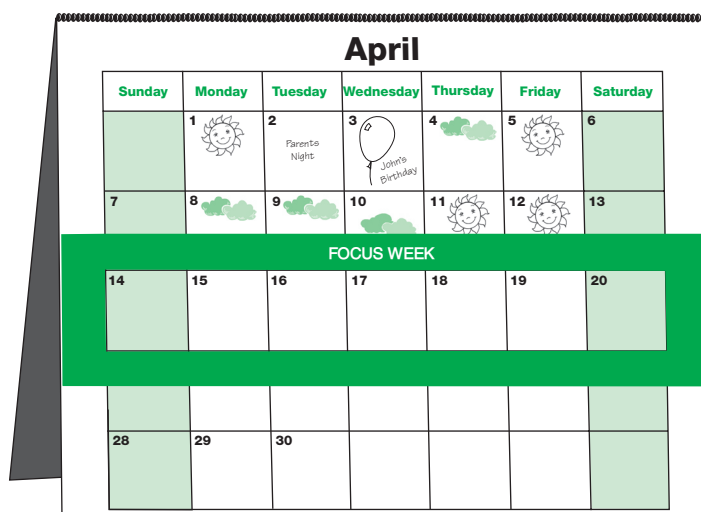


Figure 1: Classroom Calendar

The spiral calendar pad with integrated easel allows for keeping previous months available for easy reference. The large cells allow for multiple pieces of information to be recorded. See Figure 1.

Five Frame

Understanding the benchmark number “five” is an ongoing goal of *We Discover Math*. Each day, a dot sticker or other mark is placed on the Five Frame. The power of this tool is that, as students work to fill the set of five, they are able to see how many more days are needed to complete the frame, incorporating an informal exploration of partitioning numbers. Each new

Five Frames allows for exposure to the concept of “0.” See Figure 2, illustrating a Five Frame showing one day.



Figure 2: One Day on a Five Frame

Weather Graph



Data collection and analysis is a supporting focus according to the NCTM’s *Curriculum Focal Points*. It is a perfect vehicle for generating quantities to sort and count. The use of a pictograph prevents this data collection from becoming too abstract for students. Each day, a “Sunny,” “Partly Sunny,” or “Cloudy” icon is added to the graph on the appropriate line. Students are asked to count and compare numbers on a daily basis. The weather graph restarts again at the beginning of each month, allowing for a continuation of the conversation regarding “0.” Sky conditions are also recorded daily on the Calendar through the use of custom stickers. See Figure 3.



Figure 3: Weather Graph

TEACHER GUIDE

The content is divided among 10 units, each containing eight activities. The activities highlight the Focus Content and the Supporting Content as outlined in the National Council of Teachers of Mathematics’ (NCTM) *Curriculum Focal Points*.

Focus Content:

- Number and Operations
- Geometry
- Measurement

Supporting Content:

- Data Analysis and Probability
- Algebra

In addition, the activities provide multiple opportunities to address the *Principles and Standards for School Mathematics* (NCTM) strands of problem solving, reasoning and proof, communication, connections, and representation. The activities regularly contain suggestions for assessments and for math centers. **Activities are intended to take about 10 minutes of class time**, with many taking multiple days to complete. Some activities are presented in multiple parts, linked by a common mathematical strand, and take longer to complete. **The pacing of the activities will vary according to the needs of students.**

Nearly every activity begins with students gathered in a common area. This allows for them to see the activity develop. During this part of the activity as well as the more independent work that follows, observations of individual students can take place.

The Unit Organizer

The first page of each unit is referred to as the Unit Organizer. It is an important tool in the implementation of *We Discover Math*. It gives an overview of the content for the entire unit and serves as a reminder that the pace at which students move through the program should be determined by on-going assessments of their readiness for the content.

Each Unit Organizer has a grid showing important elements of individual activities. There is a brief description of the activity, references to pages in the *Teacher Guide* and the *Memory Book*, and a list of materials needed to facilitate the activity.

In addition, icons are used to indicate the following:



Look for this icon on Unit Organizers and Activity Guides. It will appear when there is an addition to the classroom calendar. If the calendar program has not progressed as far as the icon might indicate, simply set the suggestion aside for another time.



Look for this icon on Unit Organizers and in Activity Guides. It will appear when there is a suggested opportunity to extend an activity in an individual or group format, offering flexibility in managing content. Exploration Stations also offer opportunities to differentiate content for a range of learners.

Cross-Curricular Connections icons appear on the Unit Organizer Grids as well as within the Activity Guides. They are as follows:



Physical opportunities are highlighted when the activity allows for practice with fine and/or gross motor skills. They present opportunities for students to participate in finger plays, signing numbers, cutting, drawing, and dancing.



Fine Arts are embedded throughout *We Discover Math*. They present the opportunity for students to participate in dramatic play, experience literature, and incorporate art, poetry, and music.



Social and Emotional development opportunities are integral to *We Discover Math*. Whether students engage in whole-class, partner, small-group, or individual activities, awareness is developed as to their contribution to the learning of themselves and others. Students learn to take turns, share, play fair, and cooperate with others, while building a sense of self.



The Media and Technology icon indicates the opportunity to interact with mediums such as print, computers, and photography. It also indicates the opportunity for students to explore the expression of mathematical ideas through the use of number lines, drawings, and by creating their own “books.”

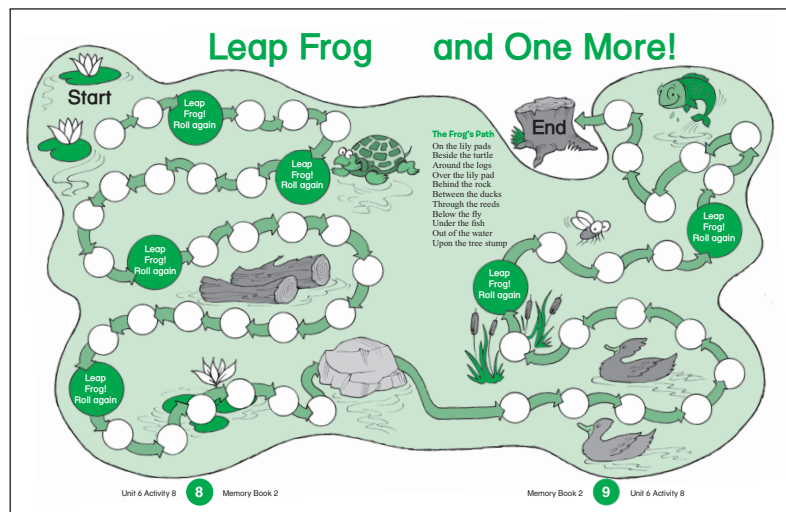
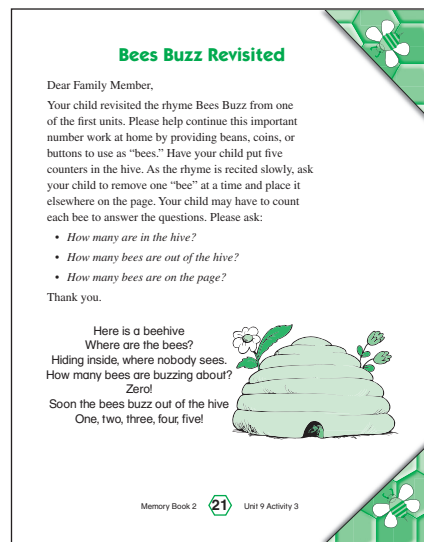
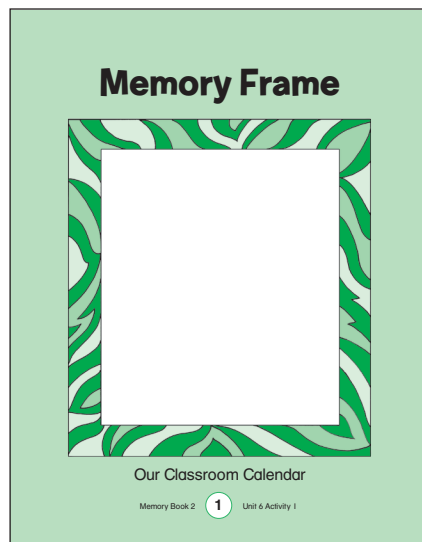
Following the grid on the Unit Organizer is a list of the Literature Connections incorporated into the activities.

This unique component serves as a:

- place for students to record their work
- way to communicate with families on a regular basis
- way to revisit previous content
- journal of the pre-K year
- vehicle for showing students’ mathematical growth over the course of the year

The pages of the *Memory Books* are filled with activities and notes to families. In most units, a page designated a “Memory Frame” appears. If a digital camera is accessible, we encourage the inclusion of photographs of students working in the classroom on various activities. If this is not possible, the pages can be used for students to provide their own illustrations to be completed either during exploration time or at home.

Please note that *Memory Book 1* contains pages for Units 1–5 and *Memory Book 2* contains pages for Units 6–10. These books will hold treasured memories of the students’ first year of formal education.



Assessment in *We Discover Math*

The pre-kindergarten classroom teems with energy and abounds with wonderful mathematical ideas. Students are learning and investigating all the time. A look at their growth over the pre-kindergarten year needs to be done with the same excitement and invigoration. Assessment should not be an intrusion into their explorations, but rather a partner in them. Providing opportunities, situations, and an active, engaging environment in which learning can take place, is often the best way to teach pre-K students. These same opportunities provide teachers with ample time for questioning, listening, and observing.

Two elements often come into play when looking at learning:

- The development of the student; their maturity as learners; their readiness
- The prior experiences students bring to the classroom. Have they counted before? Have they ever been asked about a triangle or rectangle? Have they explored a pattern?

When looking at an individual student's growth over time, attention needs to be paid to both of these elements. What did the student know at the beginning of the year, learn through the year, and accomplish by the end of the year? Think of this learning as a continuum.

One of the most important tools in any teacher's "assessment toolbox" is observation.

Ongoing observational assessment means:

Includes:

- Listening as students go about the "business" of learning
- Asking questions
- Systematic documentation
- Reflection
- Using information to help make instructional decisions and to inform parents about student growth

Observational assessment does not include:

- Being a "fly on the wall"
- Making occasional notes
- Devaluing the process. It is a critical element of assessment.

Walk into any classroom and ask the teacher to describe a specific student as a learner, i.e., what does the student know, how does the student learn best, what are the student's strengths and challenges? Virtually every teacher can answer questions such as these. The issue is in taking advantage of available opportunities to document the information.

Some helpful hints about observational assessment:

- Begin slowly and with a few students a day
- Document what is known and build on it
- Interact with students
- Date and comment when observation is fresh. Do not try to "recall" it later.

ASSESSMENT COMPONENTS

Assessment opportunities are found in activities and in less structured time. The National Council of Teachers of Mathematics' *Curriculum Focal Points* (2006), recommends that pre-kindergarten students spend the majority of their time on numbers, measurement, and geometry. Therefore, the "Focus Content," as indicated in the *Goals for the Year* document, forms the heart of the assessment. Data collection and algebra, having served as contexts for the other three content areas, are of secondary focus. The record keeping asks that these two strands be commented upon only periodically. Narrowing the focus has the intent of helping making observational assessment more manageable.

Within Activities

- **Content Emphasis** is found near the beginning of each activity. It highlights the content of the activity, indicating which goals may be observed during the activity.
- **Assessment Suggestion** box, included with many activities, points to specific content and serves as a reminder of other opportunities.
- Questions to ask when implementing the activity are regularly included. They are bulleted and italicized to be easily identified. The questions provide a focus and further the exploration.

Remember that activities comprise only a part of observation time. Many opportunities come from observing as students investigate ideas and concepts during exploration both before and after activities.

Observational Recording Materials

Two tools aid in the efficiency and efficacy of recording observational assessment. They are the "Memory Card" and the "Pre-Kindergarten Mathematics Portfolio."

Memory Card

The "Memory Card" provides a workspace for recording observations of individual students on a regular basis, focused on unit content. A "Memory Card" is simply a 3" x 5" index card. Use a clipboard and attach the class Memory Cards as shown in Figure 4. Figure 4 also includes an example of an individual card. This becomes the day-to-day record. In addition to comments, the use of "E," "D," "S" and N/A facilitates record keeping:

E = Entry

D = Developing

S = Secure

N/A = Not applicable at this time

Designations such as these are a very descriptive way of indicating growth over time. For example, a student having his or her first educational experience and without the background of others in the class may be at the "E" level for some time. Knowing this, and being able to indicate it, is a powerful tool both for communicating with parents and in planning instruction.

Some students will have the “S” designation earlier than others. Be sure to periodically recheck that this particular content is lasting.

The clipboard facilitates the use of this recording method. A full “Memory Card” is placed in that student’s portfolio for later reference. It may be helpful to tape the included list of goals to the back of the clipboard for easy reference.

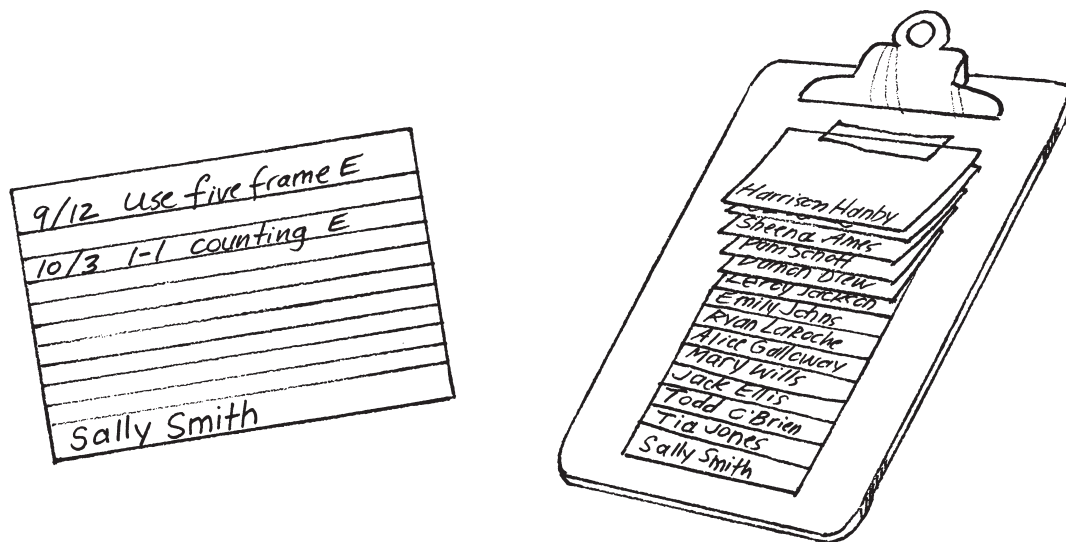




Figure 4: “Memory Card” and Clipboard

Pre-Kindergarten Mathematics Portfolio

The program also contains a folder called the “Pre-Kindergarten Mathematics Portfolio.” There is one for each student. The folder itself is designed to aid in transferring information from the “Memory Card” onto an individual student record. Each student’s growth is shown along a continuum. Make it a practice to indicate progress along the continuum on a regular basis, a minimum of four times over the course of the year.

In addition to being a place for the recording of the results of observations, the “Pre-Kindergarten Mathematics Portfolio” is an ideal place to store completed “Memory Cards” as well as papers serving as examples of student work. Although many of these pages are in the *Memory Book*, any that are duplicated as center activities, samples of written work, accounts of student-utilized problem solving strategies (dictated or student recorded), and expanded teacher notes are appropriate for inclusion in the portfolio. See Figure 5 for a sample from the Pre-Kindergarten Mathematics Portfolio.

E  D  S		Focus Content Goals
		<i>Numbers and Operations</i>
E 9/4 has no experience counting		Counts small sets of objects, actions, and sounds using one-to-one correspondence with stable word order
		Develops the meaning of "0"
E 9/6 #order unknown	D 12/15 #'s 1-5	Counts verbally up to 10 and beyond
N/A		Starts verbally counting, by one, from any point
N/A		Counts verbally backward from 5

E = Entry

D = Developing

S = Secure

N/A = Not applicable at this time

Figure 5: Pre-Kindergarten Mathematics Portfolio Sample

Finally, remember that the primary purpose of assessment is to promote students' abilities to learn valid, important, lasting mathematics. Students need to learn with understanding. Ongoing assessment can aid in this critical mission by constantly and consistently illuminating the path toward this goal for all students.