Notes for Additional Activities Video

In this short video we describe simple instructional activities that are appropriate for use in conjunction with the Patterning and Partitioning sequence. These activities are not part of the sequence, per se, but complement it and can be interspersed throughout. Our intention is that these are used only sparingly. And, as with all of the inquiry instructional activities, the intention is not that students learn to "do" these activities or get "good" at them. Rather, through engaging in these activities, students have opportunities to further their conceptual development of number and hence their learning. Each of these activities provides a context for posing tasks.

These four activities are:

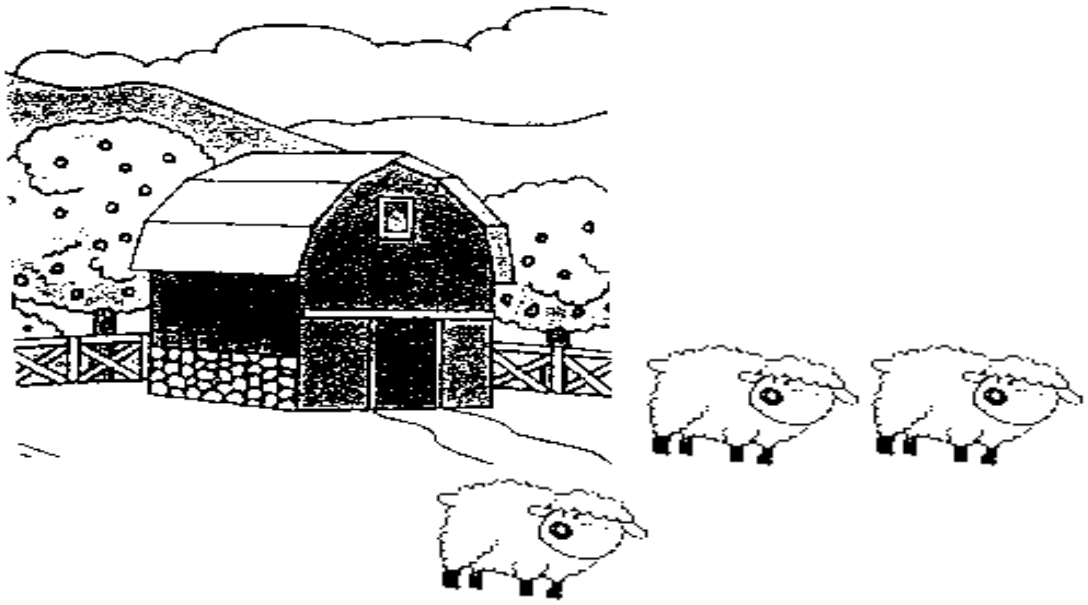
- Hidden objects
- (Single-Decker) bus
- Doubles Scenario
- Money Scenario

We will describe each context and explain how it can be used productively to pose problems to the students.

Hidden Objects

The Hidden Objects context uses a picture of a barn and some sheep as the basis for posing question. The teacher shows the picture of the barn and the number of sheep she wishes to use in the task she will pose (by covering the remaining sheep). This is not a flashing task. The picture remains visible throughout.

We will explain how to use the context by using the example where 3 sheep are visible. This is what the teacher would show.



Sample Questions:

- There are 4 more sheep in the barn. How many sheep are there?
- There are 6 sheep in all. How many are in the barn?

The first sample question is an addition task. The second is what we call a missing addend task. How might children approach these tasks? As we've said before, these tasks are intended for use along with the Patterning and Partitioning activities. They can be interspersed throughout and used relatively early. As such, many children will use finger patterns to figure these out. Notice the similarity of these tasks to the finger pattern tasks:

- Show 3 fingers. Show 4 more. How many fingers do you have now?
- Show 3 fingers. How many more do you need to have 6?

More Sample Questions:

- There were 5 sheep in the barn and these came out. How many are still in the barn?
- There were 7 sheep playing in the barnyard. Some went into the barn and these stayed in the yard. How many sheep went into the barn?

These sample questions can be thought of as subtraction, though we do not use that language with the students.

The first is a simple "take away" task. 5 take away 3. What will children do? Many will use their finger patterns to solve this task. Others may already just know that 5 take away 3 leaves 2. This task is similar to the finger patterns task: Hold up 5 fingers. Take down 3. How many do you have now?

The second task is much more complicated. The general format of the question is a missing subtrahend task. If you start with 7, how many do you have to take away to have 3 left? This task is similar to the finger pattern task: Hold up 7 fingers. How many do you have to take down to have 3 left?

The similarity of these tasks to the finger patterns tasks provides the teacher with some guidance about when it is appropriate pose them.

The purpose of the hidden objects activity is to provide an opportunity for children to develop concepts related to simple addition and subtraction tasks and the more complicated missing addend and missing subtrahend tasks using a limited amount of perceptual material (the visual material on the picture). The tasks are posed using meaningful stories and not using formal mathematical symbols or mathematical language associated with written tasks. For example, the task might be

> There are three sheep that we can see in the barnyard. There are two more in the barn. How many sheep are there on the farm?

Nowhere in the statement of the task is the language of addition or subtraction used.

The sample questions are at varying levels of difficulty. In any given lesson, the teacher may decide to limit the questions to one or two types, depending on the purpose for that lesson.

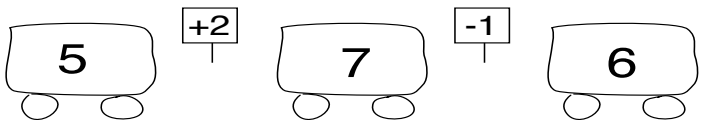
As with all activities in this sequence, the purpose is to have children figure out the tasks in ways that make sense to them. It is not to get them to use a specified approach. For example, many children at this stage will not count on to solve the missing addend task because they have not yet developed number as a composite unit. Such children are unable to count on meaningfully. If we insist that they do so, they will try to learn "what it is they are supposed to do" rather than figuring out things in ways that make sense to them.

We always have children in our classes at different levels of conceptual understanding of number. Consequently, children give solutions at different levels of sophistication. This rich variety is powerful because children do not attempt to use methods that are beyond what they can understand. Rather, they begin to take over methods that are just beyond what they have been doing. In this way, they gradually advance in their level of sophistication *on their own*. That is, the students differentiate the instruction themselves. This issue is significant because it points to the difference between a child coming to think of mathematics as something that makes sense and is comprehensible or as something that is a collection of incomprehensible rules and procedures, and is, therefore, confusing and anxiety producing. What we are pointing to here is how it is that children develop mathematical self-confidence.

(Single-Decker) Bus

The bus context provides another storyline for posing additive tasks to student. This context is taken from the work of Jan van den Brink of the Freudenthal Institute, The Netherlands. We've added the words "single-decker" for the teacher's benefit to distinguish it from the double-decker bus that was described in the partitioning activities.

In this story line, there is a bus that travels along and stops at various stops where people get on and off the bus. The activity is very flexible in that the teacher creates the story to suit the purposes of the lesson. For example, the story might be that 5 people are on the bus. At the first bus stop two more people get on. The class figures out how many people are on the bus now. The story continues in this fashion. The teacher poses the story and the children figure out the number of people on the bus as she goes along. She might draw a picture on the whiteboard showing the bus traveling along, filling in the numbers in the bus stops and in the bus to indicate what is happening and to record what the children figure out.

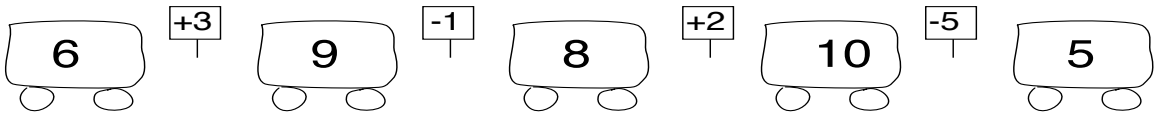


The example shown here shows how the whiteboard would look after a story in which the bus starts with 5 people on it, 2 people get on at the first stop, and 1 person gets off at the second stop. Numeric symbols indicate what happens at the bus stop. For example, +2 means that 2 people get on the bus. -1 means that one person gets off. In this way the teacher introduces the symbols + and – very naturally without referring them to with the formal mathematical names, addition and subtraction. The symbol + simply is used to indicate that more people get on. The symbol – is used to indicate that people get off.

Variations of Bus Activity

Variation 1
An entire story line is laid out in advance and the children figure out the story. That is they "tell" the story.

Tell the story of what happened.



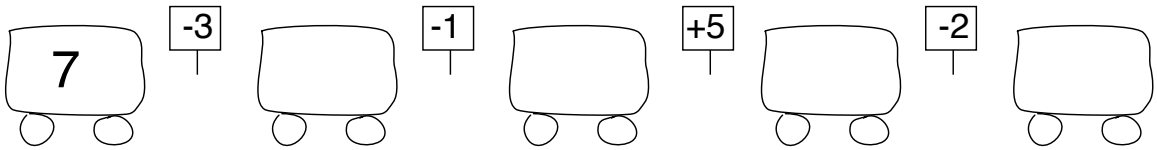
This variation is designed to ensure that students understand the story line and the symbolism used to show it. All of the numbers are filled in. There is nothing to figure out. The children's task is to "read" the story.

The bus starts with 6 people on it. At the first stop 3 people get on. Now there are 9 people on the bus. At the next stop 1 person gets off. Now there are 8 people on the bus. At the next stop 2 people get on. Now there are 10 people on the bus. At the last stop 5 people get off. Now there are 5 people on the bus.

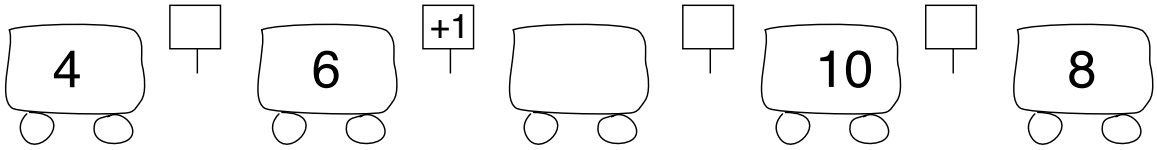
Alternatively, the teacher can have the children figure out the number after each bus stop as they tell the story.

Variation 2
Show a "bus story." The children's task is to fill in the missing quantities.

Example 1:



Example 2:



This variation shows a "bus story" with some missing quantities. The children's task is to figure out the missing quantities. The story can be shown on the whiteboard and used as a whole class activity. Alternatively, the children can be given a piece of paper that shows the story and can work individually or with a partner to fill in the missing quantities. If used for individual or partner work, the activity is most productive if it is followed by a whole class discussion. The goal is not to "check" the children's work to see if they "got it right" but to talk about how they reasoned to figure out the missing quantities.

The simplest version of this activity is shown in Example 1. The number of people on the bus at the beginning is given and what happens at each bus stop is given. Children then figure out how many are on the bus after each stop.

Example 2 is more complex. In some instances the task is to figure out how many people are on the bus but in other instances the task is to figure out what happened at the bus stop.

Variation 3

Children create their own bus stories, either orally or using paper and pencil format. This variation is very open-ended. It is always interesting to see what children do when they create their own stories. Experience shows that they reveal much of what they understand as they do so. Often children use numbers that are comfortable for them. For example, they might show 1 person getting on the bus at a stop and then 1 person getting off at the next stop. Children that are more sophisticated might choose to use larger numbers. Our intention with this task is that the numbers are kept small, say 10 or less.

The purposes of the bus activity include:

- Introduce the symbols + and - to signify "more" and "taking away. However, in our use of the activity we have not gone to the next step of using number sentences as a means of recording the results. Our goal is that students think about "more" and "take away" and not of formal addition and subtraction. In our experience, many curricula introduce formal mathematical symbolism, such as number sentences, far too early, before children have had a chance to develop informal concepts.
- Use a series of tasks in sequence.
- Provide children an opportunity to verbalize the meaning of the symbol + as "more" and the symbol – as "taking away."
- Provide tasks that foster the concept of reversibility of operations. For example, at one stop 3 might on and at the next stop 3 get off.

The bus activity is very versatile. Teachers will surely think of ways to use it that are not included here. Be creative and make the task your own. It is easily used from time to time in conjunction with the Patterning and Partitioning activities.

Doubles Scenario

In this activity the teacher poses some scenario that suggests doubles, such as the number of people on a Ferris wheel (that has two passengers per car) or twins (where the mother buys the same number of items for each twin. Questions are then posed to elicit thinking about doubles.

Ferris wheel

Example: Each car of the Ferris wheel holds 2 people. How many people can ride in four cars of the Ferris wheel?

Twins

Example: Mrs. Smith bought 6 markers for Tom and the same number for Tim. How many markers did she buy?

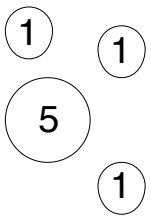
The purpose of this activity is to foster children's development of doubles combinations. Children have a natural tendency to learn doubles early. When they have them in hand they can use them to solve other related tasks. For example, a child may figure out that 6 + 7 is 13 because 6 + 6 is 12.

Money Scenario

In this activity simple tasks are posed using pennies and nickels. The teacher creates a story and shows a picture of some coins. Children answer the questions posed using the visual materials to assist them.

Example 1:

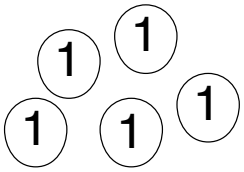
This is Sue's money.



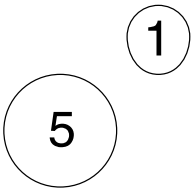
Can she buy a sticker that costs 7 cents?

Example 2:
Who has more money Sam or Sue?

Sam's money



Sue's money



The purposes of the money activity are to:

- Foster development of a composite unit of five.
- Use five as a composite unit in a variety of story settings.

Using a nickel as five is an early use of coordinating units of different rank. The nickel is a single unit that is itself made up of 5 smaller units (pennies). In actuality, the situation is even a bit more complicated because a nickel is not "made up of" 5 pennies, but instead "has the same value" as 5 pennies. It is ONE thing that has the same value as FIVE things of lesser value. Coordinating units of two ranks is very complex and may be very difficult for some children. Early work with nickels and pennies provides many opportunities for these children to encounter and work on this difficult conceptual aspect of number.

Overall Purpose of these Additional Activities

- To provide children opportunities to solve problems in various story contexts.
- To promote conceptual development of early number concepts.

These activities use story contexts to pose tasks and in that sense can be thought of as general problem solving. Discussions are integral to each of the tasks. Having said that, it is important for teachers to also remember that each lesson needs to "keep moving" along and not drag on. Teachers have to make judicious decisions about when to call for more than one solution to a task, when and how much to dwell on each explanation, and when to simply move on to another task. We remind teachers that the intention is not that children learn to "do" these activities. Rather they are a means through which children learn. In other words, our intention is not that an activity be used over and over again until most children can easily "do" it and get it "correct" right away. These activities are designed to promote conceptual development of early number concepts.

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Timeline

We include a timeline for your reference.

SUGGESTED TIMELINE FOR FIRST 6 WEEKS OF GRADE 1

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
PATTERNING						
Finger Patterns	----------	----------	--- --- --- ---	--- --- --- ---	-- -- -- --	-- --
Dot Patterns		----------	----------			
Single Ten-Frame			----------	----------	----------	----------
PARTITIONING						
Monkeys in the Trees					--- ---	---
Double Decker Bus						-- --
All the ways						-- --
ADDITIONAL ACTIVITIES						
Hidden Objects			--- --- --- ---	--- --- --- ---	--- ---	
Single Bus				--- --- --- ---	--- --- --- ---	--- --- --- ---
Doubles		--- --- --- ---	--- --- --- ---			
Money					--- --- --- ---	--- --- --- ---