

# Observers and Objects

(Frames of Reference)

## Background

- Human brains use several different frames of reference to organize ideas about spatial relationships among people, buildings, neighborhoods, cities, countries, even continents.
- There are some good neuroscientific reasons why this happens. A teacher doesn't necessarily need to know all the details, but it IS useful to be aware of the basic fact!
- Children will be at a disadvantage later if they do not learn how to use various frames of reference (and if needed to translate from one to another, although that is hard at first).

Here is the problem, stated in adult terms. The same location-words can mean different places, depending on the frame of reference. For example, imagine that you are looking at a bus from the side. If someone nearby says, "she's standing behind the bus," that could mean she is on the other side of the bus from where you are standing (your observer's frame of reference) or at the back of the bus (the object's frame of reference). Or, consider a movie theater on a street corner:

- viewing the parking place "to the left of the big sign on the street wall"
- entering the theater "the entrance door on the left"
- choosing a seat "a seat near the left aisle"
- exiting the theater "go out the door on your left"
- on so forth . . . . (see transparencies for illustrations)

## Vocabulary

**Review:** position, next to, on, on top of, underneath, beside, left, right

**Concentrate on:** above, below, close to, far from, to the left of, to the right of, between

**Introduce:** closer to, farther from, farther to the left, farther to the right, beyond, opposite  
north, east, south, west

## Materials:

- some small dolls and familiar objects
- optional: a moveable plastic eyeball (a candy one, to give as a reward for good answers?)

## Activities

- review ideas of up, down, front, back, left, right (do the Hokey Pokey)
- arrange things in various ways (see transparency masters for some examples)
- ask questions, listen, diagnose, and prescribe
- VARIATION: have students arrange things and quiz each other
- VARIATION: have students direct each other to move to particular places (Simon says . . .)
- EXTENSION: have students give directions to places in school, a store, a mall, a park; (after a LOT of practice) ask them deliberately to use a particular frame of reference
- EXTENSION: add a global frame of reference (north, east, south, west)

## Learner outcomes:

- awareness that a simple word like left, behind, or beyond can mean different things in different situations (in other words, from different points of view)
- better understanding of potentially confusing language about locations
- improved ability to give and interpret directions
- willingness to ask questions if needed (i.e., when getting directions to a meeting place)
- introduction to the idea of symbolic representation (buildings, people, objects, observers)  
this will help prepare them to use more abstract maps later

# Observers and Objects - Developmental Sequence

**Background:** Twenty years ago, educational psychologists were fairly unanimous in saying that school children begin with only an “egocentric” frame of reference. According to that theory, children think of other objects only with respect to their own bodies – what’s in front of them, behind them, above them, on the left, etc. New brain-scanning technology, however, has shown that human brains make several independent representations of the positions of things. They store those in different parts of the brain, and those brain structures are fully functional by age 3 or so. What children have to learn, therefore, is not how to see the world, in all of its complexity, but rather how to use words to communicate about their mental representations.

As with any statement of developmental sequence, this list indicates *might* happen with a typical child. It is not a prescription of what *must* happen in precisely this order in a classroom.

**Stage 1:** Students describe the positions of an object with respect to a person holding it.

Teacher holds a familiar object (let’s call it Joey the Kangaroo) in different positions and asks whether Joey is above, below, in front of, behind, or next to the teacher.

Reinforce by asking position questions while reading stories such as Little Red Riding Hood.

Also, consciously use these position-words as you introduce the names of other features in the classroom, especially important symbols like flag or school mascot and other words like trophy, flowerpot, eraser, storage box, globe, etc.

**Stage 2:** Students hold objects in specific positions as requested.

Teacher hands Joey to a student and asks the student to hold it in a specified position with respect to the student’s body. Introduce the idea of left and right as well as beside, in front of, behind, above, etc. At first, turn around to face the same direction as the students, rather than asking them to mentally rotate your body the first time you (as teacher) introduce the idea of “left.” Motion games (“Simon says touch your left shoulder”) or Hokey Pokey (“Put your left foot out”) can help reinforce these ideas.

**Stage 3:** Students describe objects with respect to other objects with obvious “fronts.”

Teacher places an object on a table in a particular relationship to another familiar object that has an “intrinsic” front, back, top, left side, etc. (e.g. a model car, bus, or animal). Ask whether Joey is in front of the car, behind it, next to the left door, etc.

**Stage 4:** Students arrange objects (or themselves) in groups with multiple relationships (“put Joey in front of the model car, and put the flag to the left of Joey”)

VARIATION: Students stand in rows or lines according to instructions: “Alan stands near the greenboard; Carlos stands behind Alan; Keisha behind Carlos; etc.” This can be combined with a lesson about how to get ready for a walk to the library or a field trip.

VARIATION: Students stand in rows or lines; other students answer questions or write sentences to describe how they are standing.

**Stage 5:** Establish a “global” frame of reference in the classroom.

Put a large N on the north wall, E on the east wall, etc. Have students face a named wall, or line up along a named wall. Put Joey by a wall and ask students to name the wall it is near.

**Stage 6:** Use the global frame of reference to describe relationships among objects.

Hold Joey at arm’s length in a particular direction and ask if Joey is north, east, south, or west of you. Put Joey near another object and ask what direction Joey is from that object.

VARIATION: Students describe objects with respect to each other (“Joey is on your left”) and then translate that into global terms (“Joey is north of you”).

VARIATION: Lay a map on a table with north facing the north wall. Ask students to describe the relative location of distinctively colored features: “Canada is this green area; Mexico is red; is Canada north of Mexico or south of it?” “What is between Canada and Mexico?”

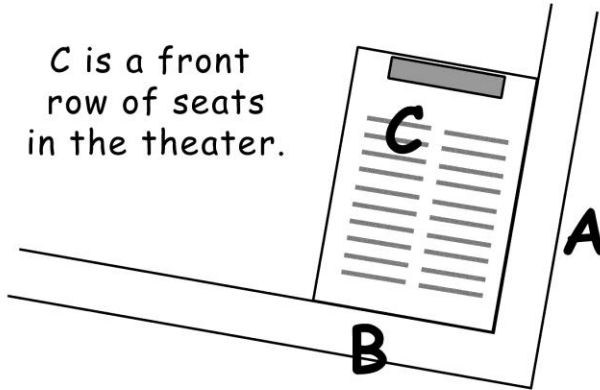
# Frames of Reference

# 1

The meanings of geographic terms often depend on where you are.

The inside of a theater can have a different front than the outside does!

C is a front row of seats in the theater.



A is in front of the theater building (from where I am looking).



B is near the front entrance to the theater.

Frames of Reference - Basic Idea

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# Frames of Reference

# 2

What is a frame of reference?

It is the group of "mental constructs" that helps give meaning to words like

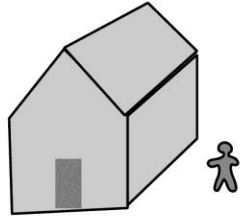
*in front of*      *over*      *above*  
*beyond*      *far from*      *behind*  
*under*      *on top of*      *close to*  
*below*      *between*      *east of*  
*to the left of*      *on*

Frames of Reference - Definition

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# Frames of Reference

# 3



Put a little doll  
next to a model house,

Ask: who might say  
"this doll is 'in front'  
of the house?"

A building can have a front door  
on the outside that is different  
from the front of a room inside.



And both can be different from what an observer  
on the side would say is "in front" of the building!

Frames of Reference - Activity

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# Frames of Reference

# 4

Use model buildings, cars, and small dolls,  
and think of different ways to ask:

What do we mean by front, behind, left, right, etc.

- when we are looking at something?  
(the observer's frame of reference)
- when we are going into something?  
(a typical user's frame of reference)
- when we think of the thing itself?  
(the object's frame of reference)

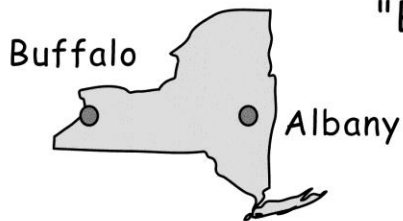
Of course, you don't use  
those terms in pre-school;  
you just watch for when  
children confuse things.

Frames of Reference - Key Questions

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# Frames of Reference

# 5



We can look at a map and say  
"Buffalo is to the left of Albany."

That simple sentence uses the observer's frame of reference; it is true only if the map is oriented a particular way.

"Buffalo is west of Albany"  
uses the world's frame of reference,

That sentence is true regardless  
of how a map is oriented.

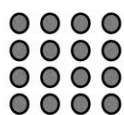
Frames of Reference - Global

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# Frames of Reference

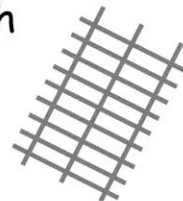
# 6

Young children (and even adults) can  
have trouble "thinking about" oblique lines.



There's a good reason for this -  
the brain stores some spatial information  
in cells that are arranged like graph paper!

As a result, it is **MUCH** easier to think of  
Manhattan avenues as going north-south  
and streets as going east-west  
(rather than at a 30-degree angle:



Frames of Reference - Complication

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