K2 Geography Arc of Inquiry

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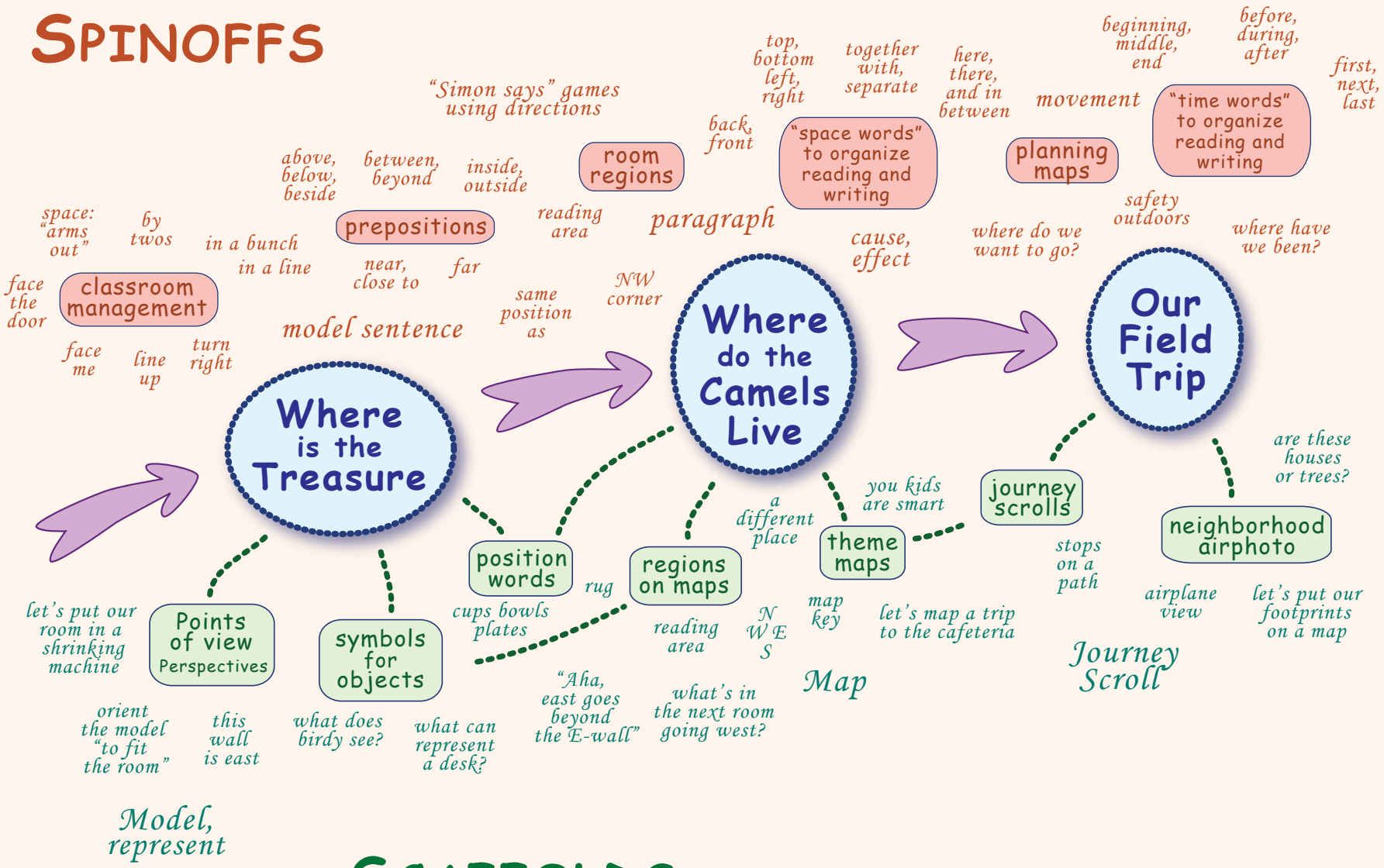


Spatial Thinking in the Human Brain

(a graphic organizer for taking notes)

More than 4000 research studies since 1995 show that the human brain has separate "networks" that do specific kinds of spatial thinking, in parallel and often simultaneously.

Spatial Analogies

Do places in similar positions in other parts of the world also have similar conditions?

AS C IS TO D

Spatial Comparison

How are places similar or different?

SIMILAR

Spatial Auras

What nearby places may be "under the influence" of this place?

NEAR

Regions (Spatial Groups)

What places are similar in some way <u>and</u> located close to each other ?

IN THE GROUP

Spatial Sequences and Transitions

How do conditions change from one place to another?

BETWEEN

ALIGNED, BUNCHED

Spatial Patterns

Why are features arranged in bunches, lines, rings, waves, or other non-random ways?

INSIDE

Spatial Hierarchies

What smaller entities are inside larger ones?

TOGETHER WITH

Spatial Associations

Why do some features occur together in the same places?

Basic Spatial Reasoning

A. Immanuel Kant said it well: *Human brains have "built-in" ways of organizing information: spatially (in space), temporally (in time), causally (by cause-and-effect processes)*

B. Brain-scanning reveals distinct networks that do different kinds of spatial organization:

1. **Comparison** – bigger/smaller, rounder/squarer, darker/lighter, redder/grayer
   Examples: Iowa is smaller than Texas, Poland rounder than Italy.
   China has more dots than Australia on this map.
   Botswana has a darker color than Zimbabwe.

2. **Proximity** - next to, near, close to, within its area of influence (its "aura")
   Examples: cabin near a lake, noisy house near an airport,
   gas station near an Interstate highway exit,
   refugee camp near a country with a civil war

3. **Region** - part of a group of places with something in common
   Examples: farms with corn fields in the Corn Belt,
   abandoned factories in the Rust Belt,
   people speaking Spanish in Latin America

4. **Sequence** - in order, along a line, on the way from one place to another
   Examples: third block along a particular street,
   grassland between rainforest and desert,
   middle-age houses between city and suburbs

5. **Hierarchy** - inside something larger, "place in a pecking order"
   Examples: counties inside state, states inside country,
   creeks inside watershed of large river,
   rivers or mountain ranges inside continent

6. **Analogy** - in a similar position in a different part of the world
   Examples: ports near mouths of different rivers,
   neighborhoods near downtowns of different cities,
   places in similar positions on different continents

7. **Pattern** - arranged in bunches, lines, arcs, waves, or other non-random ways
   Examples: forts in a line, coral reefs in a ring around an island,
   oil wells in a bunch in one part of a country,
   sand dunes arranged like waves in a desert

8. **Association** - tending to occur together with specific other features
   Examples: stoplights at major intersections,
   people with malaria in places with A. mosquitoes,
   earthquakes at borders between crustal plates

C. There are huge individual differences in how people do different kinds of spatial thinking.

D. Studies show that every student can learn to do every kind of spatial reasoning better.

E. An "expert" map reader is able to use more modes of spatial reasoning, and to use each one better, than a novice. That is why a good map reader can get more information, faster and more accurately, than a novice can.

It's like learning how to learn.

“Simon says put your doggie (block, pencil) . . .”
Some prompts to stimulate spatial thinking

A. Modes of spatial reasoning on your desktop . . .
(start with some dolls, blocks, plates, coins, markers, some colored paper to mark part of the desk)

1. **Spatial Aura, Proximity** (near, next to, close to, far from)
   Example: Next to the blue plate

   _____

   _____

2. **Spatial Hierarchy, Enclosure** (inside, outside)
   Example: Inside the green area (construction paper, etc.)

   _____

   _____

3. **Spatial Transition, Position in a Sequence** (between, behind, beyond)
   Example: Between the blue and red marker

   _____

   _____

4. **Region, Spatial Group** (within a group of similar things)
   Example: A wooden block that is among many blocks

   _____

   _____

5. **Spatial Pattern, Shape, Arrangement** (in a bunch, line, circle, triangle, wave, etc.)
   Example: In a straight row of blocks

   _____

   _____

6. **Spatial Association** (together with another specific kind of thing)
   Example: With (next to) pencils, not with coins

   _____

   _____

7. **Spatial Analogy** (same position as)
   Example: In the same corner of your desk as the teacher’s book on the front desk

   _____

   _____

“Simon says go stand (sit, kneel) . . .”
Some prompts to stimulate spatial thinking

A. Modes of spatial reasoning in your classroom . . .
(identify a door, clock, globe, flag, other feature in the room to use as “landmarks”)

1. **Spatial Aura, Proximity** (near, next to, close to, far from)
   Example: Stand next to the trash can

   _____

   _____

2. **Spatial Hierarchy, Enclosure** (inside, outside)
   Example: Sit down inside the reading rug

   _____

   _____

3. **Spatial Transition, Position in a Sequence** (between, behind, beyond, in front of)
   Example: Stand halfway between the clock and the door

   _____

   _____

4. **Region, Spatial Group** (within a group of similar things)
   Example: Kneel in the desk area of the room

   _____

   _____

5. **Spatial Pattern, Shape, Arrangement** (in a bunch, line, circle, triangle, wave, etc.)
   Example: Line up in a row next to [name of student]

   _____

   _____

6. **Spatial Association** (together with another specific kind of thing)
   Example: Stand by green desks, not blue ones

   _____

   _____

7. **Spatial Analogy** (same position as)
   Example: Stand on the west side of your desk; face the north wall.

   _____

   _____

Modes of Spatial Reasoning – Associated Words

Most languages have specific words that engage the spatial-thinking networks in the human brain.
Here are some of those "trigger words" for spatial thinking in English.

Location – where is it? (Location is the "entrance ticket" to a geographical investigation. It's what makes an inquiry geographical as opposed to historical, biological, etc.)

The concept of location has two components:

Conditions – what is at this place? the features you can sense or measure at a place
trait feature characteristic observation site

Connections – how is this place linked with others? connections with other places
link route path influence

Modes of spatial thinking:

Comparison similar/different more/less larger/smaller crowded/empty warmer/colder etc.

Aura (Proximity) near next to close to/far from within range/not under the influence of

Region in group/not in group similar to belt (as in "Corn Belt")

Hierarchy within inside whole/part [of] higher/lower [in "pecking order"] tributary/main stem

Transition first/next/last between earlier/later gradual/abrupt gentle/steep [slope]

Analogy same/different place [middle/edge/corner/upstream etc.] similar/different [position]

Pattern aligned/unaligned like a ring, arc, wave, etc. even/bunched/random balanced/biased

Association together with/separate from associated correlated similar/different [pattern]

Spatio-temporal thinking (thinking about space and time together):

Change past/present/future changing/stable early/late increasing/decreasing over time

Movement fast/slow advance/withdraw rising/falling east/west etc.
[push/pull emigrant/immigrant export/import]

Diffusion grow spread/shrink expand/contract [contagion/extinction]

Key idea: many of these "relationship concepts" are processed by separate networks in the human brain. As a result, there can be individual differences, which can be important when students are "reading" a map or graph. Unless prompted, some students may "see" different relationships than others.

Teaching Left and Right

A. It's not easy. Laterality can be a difficult concept that requires a lot of patience and repetition.

1. It is NOT necessarily beneficial to try to teach left and right together, as opposites.
2. It IS beneficial to stand next to a child, rather than facing the child, when demonstrating.

B. Development. Children usually develop lateral preference (right- or left-handedness) about age 3.

1. Observe – which hand do they use more often with crayons, which arm through coat first, etc.
2. If they use the right hand when coloring, you have a menemonic – "you write with the right."

C. Verbal reinforcement. Incorporate lateral terms when doing other activities.

1. "I'm holding your right hand when we cross the street." "We turn to the left at this corner."
2. "I'm tickling your left side." "The milk is to the right in this store."
3. "Put your right arm in the coat sleeve." "I see you are putting your left shoe on first."

D. Tried and true activities.

Songs such as "Doing the Hokey Pokey"

Mimic games such as Simon Says ("Raise your right hand." "Bend your left leg." Etc.)

Directional movement in a circle – ("We all go to the right, starting right now.")

Learning your letters – hold hands out, fingers up, palms forward, thumbs pointing in – the left hand forms a rough "L" shape, L for Left – (might just help with reading too!)

E. Label things.

If they recognize their names, write the first letters in the left shoe and the rest in the right. Tell the children they have to see their names before putting their shoes on.

Recommend buying (or just decorating, with permission) shoes with flowers or characters such as Batman or Snoopy. Explain that the character must be on the outside in order to 'see what is going on in the world' and if the characters are hidden on the inside, the shoes are on the wrong feet.

Take advantage of "built-in" labels, permanent or temporary – moles, freckles, cuts, band-aids, etc.

Put a stamp or washable tattoo on one hand (preferably the dominant one).

Dab a little perfume on one wrist. "Sniff your hands – your right hand is the stinky one today."

F. Sort things into piles – left, middle, right (this also helps them learn various kinds of criteria)

G. Listen to the GPS.

H. Do some worksheets.

A Google search will reveal a number of possibilities. Alas, the list I carefully compiled a month ago has a number of broken links already. Perhaps the following will survive a bit longer:

http://skills4lifeot.com/teaching-child-left-right/

http://www.kidspot.com.au/schoolzone/Learning-games-Best-teaching-practices-for-left-vs-right+4249+316+article.htm

http://www.pinterest.com/alcantra/teaching-left-and-right/

http://www.pinterest.com/moorevision/directionality-left-right/

http://www.playdoughtoplato.com/2013/10/10/right-vs-left/

Representing Our World

(Spatial Reasoning and Communication)

Background

- Research clearly shows that human brains have several separate "networks" that organize spatial information in different ways. This research has three huge implications for teachers:
  1. Learning how to learn – spatial reasoning helps kids learn from maps, graphs, stories, etc.
  2. Choosing tools – different modes of reasoning support learning different kinds of information
  3. Individual differences – some kids are good at spatial sequencing, others associations, etc. Proficiency with one mode does not necessarily mean proficiency with another.

It's helpful to think of this as being like our arm muscles – we have a bunch of different muscles that help our arms do different things. They often work together, sometimes doing things in sequence and sometimes doing several things at the same time. We use different combinations of muscles to do different things, like throw a baseball, play a guitar, eat a bowl of soup, or smooth a clay sculpture.

Coaches who want to help their players strengthen their arm muscles do not tell them to do only pushups or bicep curls in the gym – on the contrary, they prescribe a number of different exercises. And they often prescribe specific exercise to bring weak muscles up to the level of the others.

This is exactly what we need to do.

Materials (in general, the larger the better for hands-on materials)

- a model or map of the classroom, on a table or desk near the middle of the room
- small objects to represent things in the room (e.g., marble for globe, block for desk).
- desktop outline maps of the classroom,
  with a few key features like the entry door, windows, and/or whiteboard for orientation
- maps of the schoolyard, local community, state, etc.

Procedures

- Do the key parts of every lesson. Every lesson.
  Do not (NOT) do just the ones that seem most intuitively useful to you. See implication #3 above. What works best for you may not be what works best for a student, or every map-reading task.
  (There's a word for picking just some of these as a primary focus – it's called discrimination.)
- The lessons are numbered in a proven sequence, BUT they do not have to be done in that order. Become familiar with them all, and feel free to do them in different orders until you find what works best for you and your students.
- You can combine ideas in various ways, or combine these lessons with readalouds, math lessons, field trips, playground games, many other parts of the curriculum.
- The images in these pdf files are for discussion, not necessarily for use in class. You can (and should) design your own props to fit the conditions in your school.
- Evaluate students frequently, often informally, and prescribe practice with the modes they find most difficult. Often, this can be done by simply asking appropriate questions, even in the context of another lesson or a daily activity like emptying a wastebasket or lining up for lunch.

Representing Our World

(Modes of Spatial Reasoning and Communication)

1. Models and Maps – spatial representations.

- Put a whole room in a shrinking machine, so it fits on a desk. This marble represents the globe.

2. Similar or Different – spatial comparisons.

- Compare places qualitatively (similar or different) or quantitatively (more or less).

3. Near or Far – the idea of distance, and of spatial aura (zone of influence close to something).

- Tobler's First Rule of Geography: "every place has an effect on every other place in the world – nearer places have more effect than faraway places."

4. Toward and Away – the idea of direction, and of movement toward a specific landmark.

- Go toward a named landmark, or in a given direction. "Line up along the north wall." "That wall is not north – north keeps going beyond the wall. What would we see if we go north?"

5. This Group or That One – spatial group, region.

- A geographical region is like a historical era – it is a way of putting similar things together, dividing the world into smaller and more homogeneous parts that are easier to remember.

6. Sooner or Later – spatial sequences, and the transitions between places in a sequence.

- Someplace halfway between two places is likely to have conditions that are halfway between them.

7. Inside or Outside – spatial hierarchies

- Houses inside communities, towns inside states, states inside countries, countries inside continents.

8. In the Same Position – spatial analogies, places in similar geographic positions

- Identify places in similar positions on other tables, rooms, towns, watersheds, states, continents. Places in similar geographic positions often have similar conditions.

9. Strings, Rings, and Bunches – spatial patterns, non-random arrangements of things

- Distinctive spatial arrangements usually imply some force acting on objects to "line them up."

10. Together or Separate – spatial associations, things that occur in the same places

- Things that occur together are often linked in some other way, perhaps cause and effect.

11. Observers and Objects – frames of reference

- Human brains maintain multiple independent "maps" of things around them. Egocentric maps are centered on the person; allocentric maps are aligned with local or global frames of reference.

12. Continents, Oceans, and the Equator – a basic global map

- A globe is the only truly accurate representation of the ball-shaped Earth. Flat maps can show the spatial relationships that are important to answer specific geographic questions.

Exceptions: The world is big and complicated. One reason we need to look at it in different ways is that a given way of organizing our knowledge doesn't work for every kind of knowledge.

Steps in Making a Classroom Map

Michigan GLCE 1 – G1.0.1 Construct simple maps of the classroom to demonstrate aerial perspective.

Making a map of a classroom is not an end in itself. It is a high-interest activity (especially when linked with activities like Simon Says, Treasure Map, etc.), and it can have important spinoffs for both math and language arts (see bibliography of relevant research studies, especially those that deal with individual differences).

Making a map of the classroom.

In recent years, researchers in education and developmental psychology have identified several principles that can affect the success of a mapping activity. This list of suggested steps is based on more than 120 research studies that deal with what psychologist Judy DeLoache calls "The Credible Shrinking Room" – the neuroscience of recognizing that a map or model can be a representation of a larger space.

This list is for planning purposes. See the powerpoint for a rationale and illustration of each major step. Think about how to use a map task to teach or reinforce a reading/math idea too; some samples are provided. Asterisks mark steps that usually require extra time to allow many children to try it (and to assess mastery).

	Math extension	ELA extension
1. Make a box with appropriate proportions	scale	
2. Put windows (or other prominent feature of your room) on one "wall"		
3. Use a model car, bus, doll to discuss the *idea* of representation		A represents a sound
4.* Place box on table and have students rotate it "to fit the room"		
5. Add another prominent wall feature (e.g., greenboard, whiteboard)		
6.* Add other features on appropriate walls (e.g., alphabet, map, . .); students should discuss and give directions about placement		
7. Put an object (e.g. clock) *between* two existing features (windows)		
8. Name the room walls N, E, S, W, and put symbols in model		
9. Play games using wall names: (e.g., Simon says "Face east")		
10. Use wall names for class management: "Line up along north wall"		
11. Add a single prominent feature (e.g., teacher desk) inside room		
12. Add rug – hand model to student: "Put it where it goes" (see powerpoint for how this may require followup questions)		
13.* Add other single features – cubbies, table, globe – students should discuss/select/make symbols		
14. Play games using oral directions: "stand east of teacher desk"		
15.* Play games using model ("stand where doll is standing; put the doll in the model where X is standing in the room")		
16. Put desks in room and have students label theirs		
17. Use string to trace a movement path		
18.* Have students walk a movement path shown by a string in model		
19. Hide/find a treasure (do several times between steps ~15-25)		
20. Use rope to divide room and string to divide model into regions		
21.* Occasionally after about step 15, talk about point of view "What does a doggy see? What does a birdie see?" – see powerpoint		
22. Prepare and duplicate base-map of room (shape, one wall direction-labeled, perhaps a scale and compass rose)		
23. Model/discuss how to draw a feature (rug, teacher desk) on the map		
24.* Students add features to their classroom maps.		
25.* Students add lines to mark regions on their maps.		

Relevant Grade Level Content Expectations

K – G1.0.1 Recognize that maps and globes represent places.

K – G1.0.2 Use directions or positional words *(e.g., up/down, in/out, above/below)* to identify significant locations in the classroom.

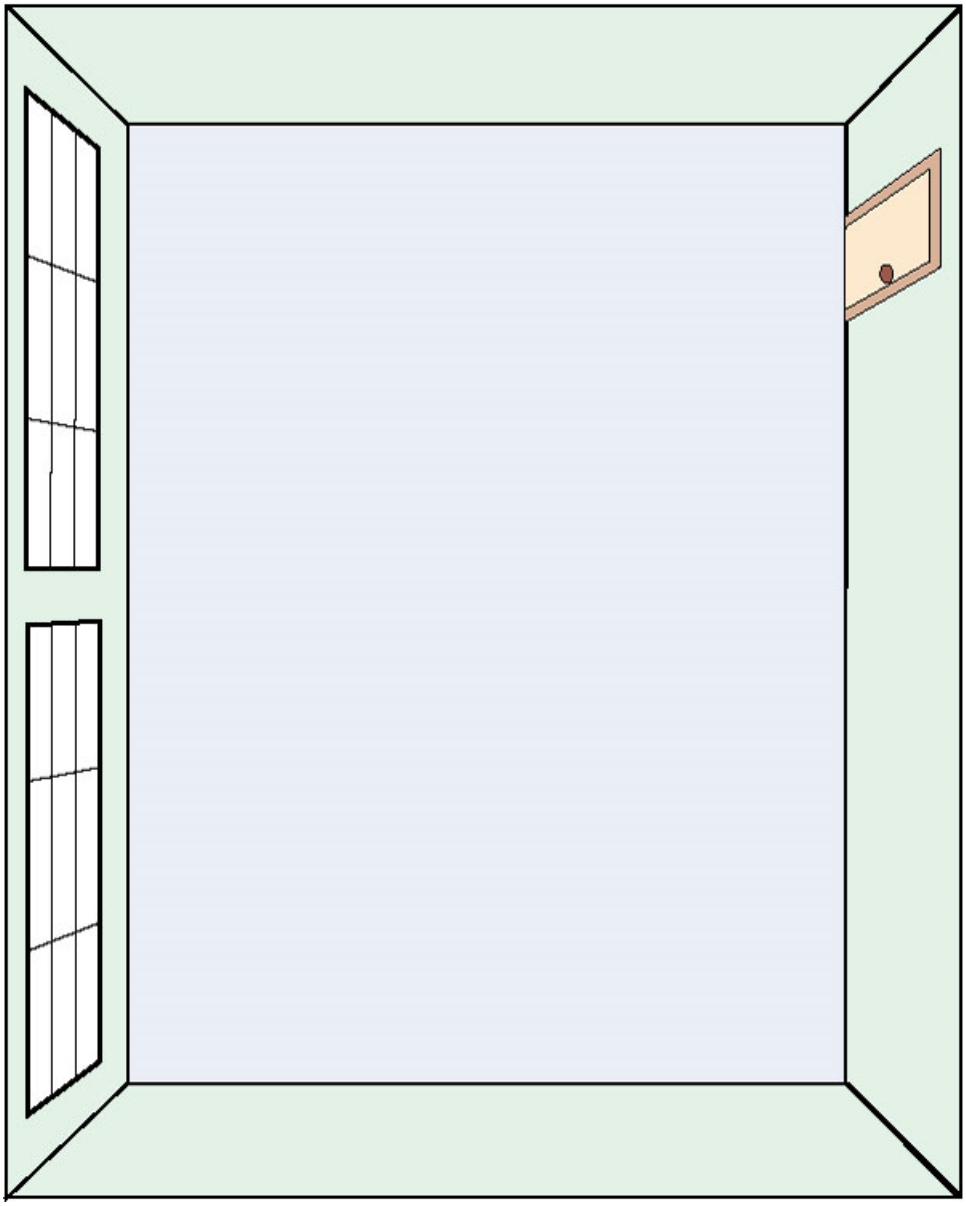
1 – G1.0.1 Construct simple maps of the classroom to demonstrate aerial perspective.

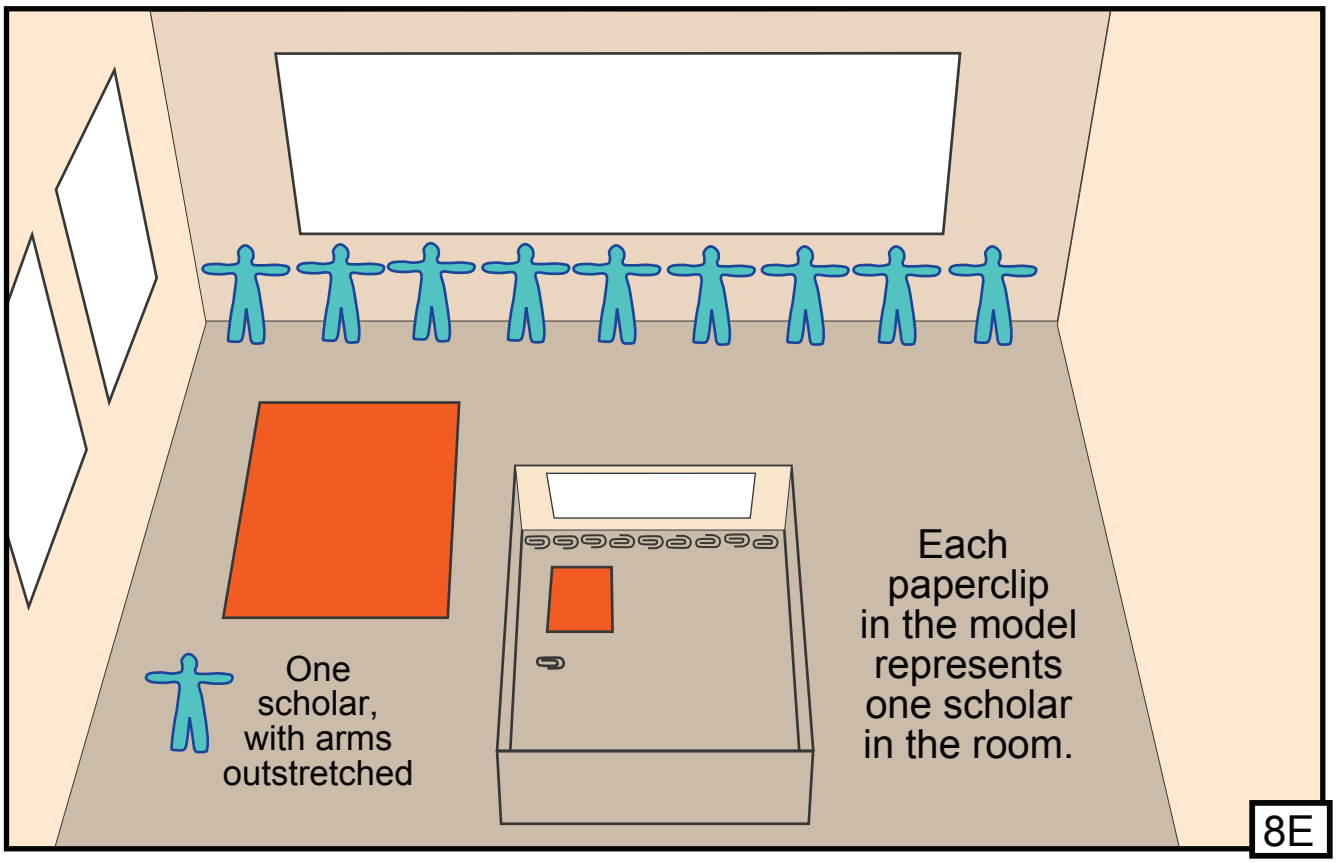
1 – G2.0.2 Describe the unifying characteristics and/or boundaries of different school regions *(e.g., playground, reading corner, library, restroom).*

2 – G1.0.1 Construct maps of the local community that contain symbols, labels, and legends denoting human and natural characteristics of place.

2 – G1.0.2 Use maps to describe the spatial organization of the local community by applying the concepts including relative location, and using distance, direction, symbols, and the key or legend.

MAP KEY





You don't need a ruler if you want to measure something.
You can do what people did in ancient times. They used parts of their bodies:

A **cubit** was the distance from the elbow of a king to the tip of his finger.
For the king of Egypt (who was a really big man), that was about 20 inches.
They built a lot of buildings using cubits to measure wood and stone.

A **span** is the distance from the tip of the thumb to the tip of the little finger.
It's about half a cubit, or about 9 inches. Four spans make a yard.
(I built my bookcase using spans to measure the wood. It works!)

Where do you think people first got the measurement that we call a **foot** ?

Some first-graders in New York invented a measure of distance. They're not big enough to have an adult-sized cubit or span, so they invented something they called a **scholar**.
One scholar is equal to one first-grader with his or her arms stretched out wide.
Some scholars might be a little bit bigger; others a little bit smaller.
If nine scholars can line up along one wall of a room, they can put nine paperclips on a piece of paper and make a map of that wall. They can then go to another room and count how many scholars can line up along that wall.

In the New York school, the students said their classroom was ten scholars wide.
Their science room was not as big. It was only seven scholars wide.

1. How wide is your classroom? _____ scholars

2. How long is your hall? _____ scholars

3. Measure three other rooms and write their names and the number of scholars.
Compare your measurements with the rooms that other students measured.

4. How big is your bedroom at home? _____ scholars long, _____ scholars wide

An Oriented Globe – A Small Model of a Really Big Earth

Background : Many students have difficulty with the idea of representation – they just don't seem to believe that a one-page map can represent an entire continent (or, in the other direction, that a hand-sized drawing can represent a microscopic virus or even a single atom). Representation seems to be one of those topics that students need to encounter in several different ways before something clicks. This is especially true for a key idea of geography, namely that a classroom globe can represent the entire earth. Unfortunately, students sometimes pretend they understand it, rather than admit that they are baffled by something "everyone else seems to get." It takes some sensitivity to recognize when students don't get it, and some creativity to think of different ways to present what is basically the same idea.

Materials:

- a few models of large and small things – cars, bears, ants, buildings, a tiny doll, and a ball of clay.
- a good classroom globe (preferably in a cradle ring, rather than fixed on a "standard" slanted axis; see Figure 9F in the book)
- OPTIONAL: continents from a decent world map, cut out of foam board, flannel, masonite, etc. (the NY Center for Geographic Learning has some templates in easy-to-print form on a CD)
- OPTIONAL: a model of the classroom (see other activities where this might be useful)

Procedures

- Hold up a model of a car and ask students what it is. Most times, the answer will be simply "a car." If so, try going through an elaborate pantomime of trying to open the door and get in. Then, look baffled, and say "it can't be a car, because a car is something I can sit inside."
- Guide discussion to focus on the fact that a model car is a tiny version of something big enough for an adult to sit inside. It's like a car that has been put in a "shrink-machine" and made small.
- Shift focus to a model of your classroom, if one is available. "This is basically a small model of something that is big enough for everyone in the class to fit inside."
- Try a map of your community (perhaps a bus or subway map?) "It's a paper model of a whole city."
- Orient the globe. An oriented globe is one that has been turned so that your location is "up" and the north pole of the globe points toward the wall that you have designated as "north". In this position, the globe is an especially accurate model of the earth. Read on to see why.
- Insert the feet of a small doll in a ball of clay and stick it on top of the globe (i.e. on New York), facing north (these details are important!!) Then, stand next to it, preferably with the same pose and facing the same direction as the doll (it helps to choose a doll in a distinctive pose – I use a 2-inch plastic cowboy waving a hat, and of course I have a similar hat to wave in the same way).
- Say "this globe is now a good model of the earth; it has a model of a person on it, standing just like I am standing now. So that cowboy standing on the globe is a model of me standing on the earth."
- Quickly add that "Of course, I'm bigger than this doll; and the real earth is way bigger than this globe. But the globe is still a good model, because it IS shaped like the earth."
- Go on to demonstrate how the globe-model can be useful. For example, take a string and stretch it from the doll on top toward some place students might know (Chicago?) Say something timely, like "Suppose [our team] is playing the Chicago Bears. This globe can tell us what direction a plane should fly to get there." Then sight along the string, and point in the right direction. For older children in a multicultural setting, using an oriented globe and a string to figure out what direction to point toward Mecca can be an effective application of the principle.

Learner outcomes:

- awareness of the idea of representation
- (subconscious!) appreciation that approximate knowledge of important geographic relationships is more valuable than precise knowledge of trivial facts about places

Issues to be resolved:

- How to overcome the impression that the earth is basically flat. This may be a bigger issue in rural areas, where students can actually see the horizon, and it does look flat.

Steps in Making a Playground/Community Map

Michigan GLCE 2 – G1.0.1 Construct maps of the local community - symbols, labels, and legends.

Michigan GLCE 2 – G1.0.2 Use maps to describe the spatial organization of the local community by applying the concepts including relative location, and using distance, direction, symbols, and the key.

Making a map of a playground or local community is not an end in itself. It is a high-interest activity (especially when linked with activities like Treasure Map, etc.), and it can have important spinoffs for both math and language arts (see bibliography of relevant research studies, especially about individual differences).

Making a map of the playground.

In recent years, researchers in education and developmental psychology have identified several principles that can affect the success of a mapping activity. This list of suggested steps is based on more than 120 research studies about the neuroscience of "seeing" a map or model as a representation of a larger space.

This list is for planning purposes. See the powerpoint for a rationale and illustration of each major step. Think about how to use a map task to teach or reinforce a reading/math idea too; some samples are provided. Asterisks mark steps that may require extra time to allow many children to try it (and to assess their mastery).

	Math extension	ELA extension
1. Obtain an aerial photograph of the school grounds	_____	_____
2. Identify the north end of the photo	_____	_____
3. Go outside and identify north – put a compass rose on the ground	_____	_____
4.* Turn the photo so that it aligns with the north	_____	_____
5.* Identify your location on the photo	_____	_____
6.* Identify some prominent features visible from your location	_____	*observation*
7. Describe the direction to one or more prominent features	_____	*oral explanation*
8. Face each direction and describe what is visible in that direction	_____	_____
9. Pace a known distance and count steps (use normal gait)	*measurement*	_____
10.* Pace the distance to one or more prominent features	_____	_____
11. Draw lines on the photo to indicate that direction and distance	_____	_____
12.* Hide objects and describe their locations by noting the distance and direction from a known starting point	_____	_____
13.* Hide objects and note their locations on the photo ("it's a treasure map", and there are many variations of this idea)	_____	_____
14.* Give directions about where to seek a hidden object (this can be done in many ways, using different "languages")	_____	_____
15. Use string or drawn line to trace movement path on photo	_____	_____
16.* Show movement path on photo and have students walk that path	_____	_____
17. Use string to divide photo into distinct regions	_____	_____
18.* Describe distinct regions in schoolgrounds/nearby neighborhood	_____	_____
19. Make a simplified, abstract map based on the aerial photo	_____	_____
20.* Hide/find a treasure using a simplified, abstract map	_____	_____
21.* Occasionally after about step 14, talk about point of view "What does someone on the ground see? What does a bird see?"	_____	_____
22. Model/discuss how to symbolize a feature (swing, car) on a map	_____	_____
23.* Make a map from field observations (see notes)	_____	_____
24.* Students add features to their playground maps.	_____	_____
25.* Students add lines to mark regions on their maps.	_____	_____

Relevant Grade Level Content Expectations

K – G1.0.1 Recognize that maps and globes represent places.

K – G1.0.2 Use directions or positional words *(e.g., up/down, in/out, above/below)* to identify significant locations in the classroom.

1 – G1.0.1 Construct simple maps of the classroom to demonstrate aerial perspective.

1 – G2.0.2 Describe the unifying characteristics and/or boundaries of different school regions *(e.g., playground, reading corner, library, restroom).*

2 – G1.0.1 Construct maps of the local community that contain symbols, labels, and legends denoting human and natural characteristics of place.

2 – G1.0.2 Use maps to describe the spatial organization of the local community by applying the concepts including relative location, and using distance, direction, symbols, and the key or legend.

MAP KEY

READING

depends on several kinds of spatial thinking:

1. Letters are spatial **shapes**: O M P X S
2. Letters face specific **directions:** b d, p q, n u.
3. Letters occur in spatial **sequences**. tar ~ rat
4. Words occur in spatial **associations** (adjective - noun).
5. Words **influence** nearby words ("White-house lawn").
6. Text is a spatial **hierarchy**
   (phrases inside sentences inside paragraphs)

MATH

depends on several kinds of spatial thinking:

1. Numbers are spatial **shapes**: 2 4 6 8 0
2. A number line has a specific **direction**.
3. Numbers occur in spatial **sequences**. **911 ≠ 119**
4. Subtraction involves a **size comparison**.
5. Division is about **size hierarchies**.
6. And geometry is about **shape** and **connections**.

Spatial Thinking, Reading, and Math

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Geography Insertions in Early Math and ELA Lessons

Unit 1. A. The idea of representation

What's this? *A schoolbus* It can't be - I can't get in it. *It's a model of a schoolbus*

A model is a little thing that represents a big thing. It's like we put a big schoolbus in a shrinking machine and made it really little. Learn the word: *represents*.

Here is a model of our classroom. It's like we put this whole room in a shrinking machine. In a couple weeks, we will use this model to hide a treasure. But first . . .

B. Things that change and things that don't

Which doll could represent the teacher? Which one represents a child?

Big one is teacher, though teacher and child chosen as example both have blue dresses. The clothes we wear can change from one day to another; our size doesn't change. No matter what I wear, I'm going to be bigger than name-a-child (at least this year!) Make sentences to compare things that don't change; now do it for things that change.

Unit 2. A. Position words

Plates of different sizes and colors. Arrange, and describe. Describe, and arrange.

Here are some *position words*: Next to Inside Between On top of Underneath.

Make sentences to describe where things are.

We are geographers. We know position words.

Let's stand up and use position words – Simon says, go next to X, between X and Y, etc.

B. What does the doggy see? What does the birdy see?

Stack a small blue plate on a large red plate. Draw pictures of what each animal sees. Doggy *sees a blue plate on top of a red one*. Birdy *sees a blue circle inside a red circle*.

Stand up and make sentences to describe what different animals, people, etc. see.

We will need these words to find the treasure that we will hide in this model . . .

Unit 3. A. Frame of reference

Here is a model of our classroom. It's like we put this whole room in a shrinking machine.

What does this green paper represent? *The greenboard on the wall*. (or whatever!)
What does this represent? *The door*. (Pick obvious features and pictorial symbols.)

B. Using the reference frame

Stand up and line up along the wall that has the door.

Make sentences to describe how we are standing.

Put dolls in the model to represent where those children are standing.

We will need these sentences to help us find the treasure in this model . . .

Unit 4. A. Symbols for features

Here is a model of our classroom. And here is a symbol of our reading rug
(if the rug is distinctive enough, do it like Socrates – what is this?)

Put the rug where it goes in the model. (Likely right in middle – enclosure is processed before proximity in the brain). Really? Is it closer to the window, whiteboard, etc.?

B. choosing symbols

Choose representations of some other prominent features and put them in the model. marble globe. bookcase or cubby wall. Perhaps not desks yet – repetitive similar symbols pose a greater challenge than unique ones, require more position words.

Unit 5. A. Finding a treasure

Here is a model of a treasure. I am going to put it here in the model of our room.

The real treasure is in the same place in the room. Can you find it?
(There are many variations on this idea. Don't do them all in one day! Reinforce!)

Geography in Early Childhood – Summary of Main Ideas

Brains – deep background (You don't talk to kids about this, but it helps to be aware of it.)

Back in the 1700s, Immanuel Kant suggested that the human brain has several built-in ways to organize experience (he called them "a prioris" - in today's jargon, that's "hard-wired"):

temporal (time, history), ***spatial*** (space, geography), ***causal*** (science), ***quantitative*** (math)

Many educational approaches (behaviorism, constructivism, many other "isms") since then have assumed that "the brain is a blank slate," where a person "constructs" knowledge.

Modern brain-scanning, however, reveals that Kant was right – but . . . human brains actually have several networks that "do" spatial thinking. Like muscles in your arm, you use different combinations of brain areas to do different kinds of thinking.

Distances

Measuring a room – using outstretched arms. Measuring small things – paper clips, dolls.

Later: Measuring on a map – string, etc. Still later: on a globe – NYLAs or LANYs.
How far is it from Kalamazoo to Timbuktu? London? Moscow? Tokyo? Rio de Janeiro?

Bonus: Basic ways of comparing distance (more, less, same) use the same brain structures as mathematical reasoning – comparing distances can therefore help lay a foundation for math.

Directions

Two kinds of directions – **egocentric** (left, right, front, back), **geocentric** (N, E, S, W).

Where is the milk? – ask children for directions in a store
(Don't just correct them; go where they say and let them learn by failing!)

Name the walls. Point north. That way is north, all the time. Put this box north of the table.

Bonus: many letters (b-d, p-q, n-u) are distinguished only by the **direction** they face; learning directions can therefore help with early stages of learning to read.

Foundations for understanding

Places are different because of **where** they are. (Later: learn about Conditions and Connections)

"Metacognition" about experience – how is **there** different from **here,** where we live?

Later: Globe as a model of the earth – we're actually standing on a big ball.
(Be careful to orient globe with Michigan up, north pole pointing north.)

Equator is a belt around the middle – it's warm every day. North Pole – cold every day.
In between, it's cold at some times and hot at other times. We call that "seasons."
Later: This line on the map is the equator. Where do monkeys live? Camels? Polar bears?

Maps – spatial analogies

A map is an **analogy** – things are "in the same places" on a map as in a real place.
Kids as young as 4 can learn – with surprising accuracy - that a dot or small picture drawn in a box on paper can indicate the position of an object buried in a sandbox.

Bonus: Learning about maps can help kids form "a concept of representation" – which in turn can help them appreciate that a printed shape on a page can represent a sound or a number.

Shapes

Learn to draw a map from memory?? Michigan calls that a middle-school "expectation," but it is a questionable idea. (For example, North America has many different shapes on maps with different projections - which North America should they learn to draw?)

Better: Recognize details you can name. Describe locations of features in a larger area
Italy is a leg. Michigan is a mitten. Louisiana is a boot. Oklahoma is a pan with a long handle.
More important, teach kids to give their own names to details and then verbalize about general position in a larger area – e.g., a thumb on the east side of our state.

Bonus: Sensing the difference between general and specific can help with many school tasks.

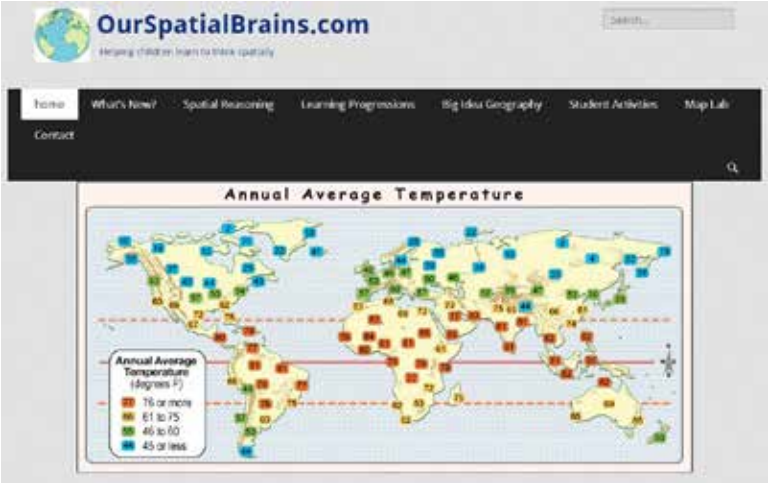
Vocabulary – describing conditions

Prepositions. next to, near, far from, on top, underneath, inside, between, together with

Adjectives. Look at pictures and talk about what it is like there. Infer, not just name!
Rainy, snowy, cold, hot, windy; steep, flat; crowded, empty; old, new; clean, messy

How do geographic conditions influence what people can do? That's the **big** question!

Young Learners Websites



http://OurSpatialBrains.com

Look at
Spatial Reasoning,
to see a research review
and a bibliography
also, . . .
Primary-school geography,
under Activities

http://ss.oaisd.org/

Look at
early grades;
the Grade 3 project
is in its third year
and quite complete;
earlier grades are
still in draft stage

Clickable Maps http://textbooks.wmisd.org/GeographicBigIdeas.html

Look at
each World region map
has several layers
(like the camel map)
designed to support activities
that scaffold map skills
also
the Michigan map
to see examples of maps
that can be used in activities
for elementary students

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access at: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.576.8614&rep=rep1&type=pdf