

Questions to Promote Spatial Thinking in Early Grades And in Later Grades

(What do we mean by “where”? Students use geography vocabulary to organize information.)

Topics, Discussion Questions

Spatial-thinking concepts
(in geography & cognitive development)

	Topics, Discussion Questions	Spatial-thinking concepts (in geography & cognitive development)
1	<p>Location Vocabulary</p> <p>Describe the location of the puppet. Is it in front of me? Who is sitting next to Sammy? Between Sonia and me? On the west side of the room?</p> <p><i>Later: Which continents are <u>next to</u> Africa? Which early civilizations had large cities <u>beside</u> seas, oceans, or major rivers? Does the <u>western</u> or the <u>eastern</u> hemisphere have more people?</i></p>	<p><i>Practice vocabulary that describes “where” something is located.</i></p> <p>Location frames of reference direction North, South, East, West</p>
2	<p>Models and Maps</p> <p>Imagine we can put this whole room into a shrinking machine, and this box represents our classroom. Where should we put a card to represent the rug?</p> <p><i>Later: What do we use to <u>show where we live</u> on our huge earth? What could we use to <u>plan or review a trip</u> from our school to the zoo? In Google maps or in a satellite image, what colors <u>represent</u> water, deserts, forests, agriculture, and urban areas? Use different kinds of map <u>symbols</u> to show where people live in New York!</i></p>	<p><i>Show a large area by arranging small symbols in relation to each other.</i></p> <p>Symbol, representation, key, legend, location</p>
3	<p>Sequence along a Walk</p> <p>What rooms do we pass if we walk from our classroom to the office? Describe how buildings are different as you walk from school to the park. Is the hill a steady uphill slope, or is it flat at first and then steep uphill?</p> <p><i>Later: What <u>routes</u> did explorers take to find the Americas? How does temperature change <u>as we move</u> from NYC to the North Pole? What conditions changed as travelers headed west on the Silk Road? When settlers moved from the eastern U.S. into the western U.S., what did they have to do to adapt to the “new” environment?</i></p>	<p><i>Watch for change as you move from place to place.</i></p> <p>spatial transition (sequence, gradient) first, next, between, last, upward, level, downward slope, abrupt, gradual</p>
4	<p>Near and Far</p> <p>Is Carlos closer to the door than Keisha, or farther away? Would it be easier to throw this balloon to Carlos or to Keisha?</p> <p><i>Later: Which continents are <u>closer to</u> the North Pole? Which states are <u>close to</u> New York? Which are <u>far away</u>? Which cities are in most danger if a country (e.g., North Korea, Iran) threatens to fire nuclear warheads on rockets?</i></p>	<p><i>Assess the influence(s) that a place has on nearby places.</i></p> <p>spatial aura, proximity, at, by, next to, close to, near, far, distance</p>
5	<p>Inside and Outside</p> <p>Is Dani sitting inside the rug area or outside the rug area? What borough is Harlem inside? What state is Rochester inside?</p> <p><i>Later: Which countries are <u>inside</u> Asia (vs. inside South America)? In the past, which areas were <u>part of</u> Islamic empires? What smaller creeks <u>empty into</u> this large river?</i></p>	<p><i>Recognize smaller pieces within (“inside”) larger pieces.</i></p> <p>spatial hierarchy enclosure, inside, part of</p>
6	<p>How Much or How Many</p> <p>Compare these two bowls. Which has more pennies in it? Compare these two buildings. Which has more rows of windows?</p> <p><i>Later: Which countries have the <u>largest</u> populations? Which of these watersheds is the largest? Which river has the most flow? Which parts of the New York City metropolitan area have <u>highest</u> incomes? Which countries produce the <u>most</u> oil? Which ones use the most oil?</i></p>	<p><i>Make comparisons.</i></p> <p>spatial comparison larger, smaller, same more, less, higher, lower, warmer, rainier, noisier, denser, richer, etc.</p>

7	<p style="text-align: center;">This Group or the Other One</p> <p>Stretch this yarn around the group of pennies (but not around the group of nickels) on the table.</p> <p><i>Later: Draw a line around the states that seceded from the Union. Which groups of states had more laws requiring segregation of races? What groups of places in the world have the lowest temperatures? What groups of countries in the world have the highest growth rates?</i></p>	<p><i>Find places that are alike and also near each other.</i></p> <p style="text-align: center;">Region</p> <p>group, member, similar, homogenous</p>
8	<p style="text-align: center;">Similar and Different Position</p> <p>See this book on my desk? Put your book in the same part of your desk. Polar bears live in this cold part of Canada. Touch a similar part of Asia.</p> <p><i>Later: Hurricanes happen in this part of the Americas. Find a similar part of Asia where cyclones (hurricanes by another name) occur. The Sahara desert is near 25 degrees North latitude. Find other deserts near 25 degrees North latitude or 25 degrees South latitude.</i></p>	<p><i>Look for places in analogous positions.</i></p> <p style="text-align: center;">spatial analogy</p> <p>similar position, middle, edge, corner, upstream, downwind</p>
9	<p style="text-align: center;">String, Ring, or Bunch</p> <p>Are the blocks arranged in a line, a ring, a bunch, or are they just scattered? How would you describe the pattern of trees in this part of the park?</p> <p><i>Later: When you look at a map of the largest cities in New York state, which seem to <u>form a line</u> and which seem to <u>form a clump</u> (cluster)? In the U.S., where do most people live (in the eastern half, or the western half)? Within Egypt, where do most people live? Why there, rather than other places? Do earthquakes tend to occur in clusters or in lines?</i></p>	<p><i>Describe patterns (non-random arrangements).</i></p> <p style="text-align: center;">spatial pattern</p> <p>even, random, clustered, pair, string, arc, ring, wave, balanced, biased</p>
10	<p style="text-align: center;">Together or Separate</p> <p>Is the sink next to the bathroom door or next to the classroom door? Do polar bears live in places with cold temperatures or in places with warm temperatures?</p> <p><i>Later: Did early civilizations and their large cities occur in places that had very warm, very cold, or in-between average temperatures? Explore <u>spatial correlations</u> between transport routes and economic activities (e.g., freeway exits and gas stations, subway entrances and newspaper boxes). Which cities in New York are <u>next to</u> rivers, a Great Lake, the Ocean? Discuss the <u>relationship</u> between mosquitoes and malaria in Africa.</i></p>	<p><i>Describe spatial relationships; look for correlations by finding what things occur together.</i></p> <p style="text-align: center;">spatial association</p> <p>together, separate, associated, correlated</p>
11	<p style="text-align: center;">Spatial Models</p> <p>A spatial model is a “cookbook” for doing several kinds of spatial thinking. The goal is to understand how a condition or event in one place can have effects in other places, often far away.</p>	<p>push-pull migration theory, El Nino, central place theory, Von Thunen location rent</p>

For a summary review of the research literature that underlies these lessons, see Gersmehl, Philip J and Carol A. 2007. Spatial Thinking by Young Children: Neurologic Evidence for Early Development and “Educability” *Journal of Geography* 106: 181-191.

For a discussion of “spatial thinking” by a cognitive development researcher, see the Summer 2010 issue of the *American Educator*, Picture This: Increasing Math and Science Learning by Improving Spatial Thinking, by Nora Newcombe: <http://www.aft.org/pdfs/americaneducator/summer2010/Newcombe.pdf>

Here is a book that discusses a number of experiments dealing with spatial thinking by young children *Making Space: The Development of Spatial Representation and Reasoning* by Nora S. Newcombe & Janellen Huttenlocher

Here is a book that discusses important ways that reading depends on “spatial thinking:” *Reading in the Brain* by Stanislas Dehaene

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