Table: Effort-reducing Effects of Different Modes of Spatial Reasoning

Mode	How it reduces mental effort	What info is needed, processed
Comparison	"new" place compared with already known	known place, info about new place, metric for comparison
	"Bangladesh has the same area as Iowa, but it has 50 times as many people."	
Aura	conditions influenced by neighbor	ID of neighbor, nature of influence, distance
	"A house that is two blocks away from the park costs a little more than one five blocks away."	
Region	part of a group of similar places	ID of region, "membership" condition, map shape of group
	"This town is in the Wheat Belt, so you expect it to have a grain elevator, a tractor dealer, ..."	
Transition	along a line from one place to another	conditions at endpoints, nature of gradient, relative position
	"Timbuktu is 2/3 of the way from the rainforest to the desert, so you expect a 4-month rainy season."	
Hierarchy	within a larger area	ID of larger area, nature of larger area, relative size
	"It is in the Colorado River watershed, so water use is subject to the rules of the Colorado Compact."	
Analogy	similar position, therefore similar conditions	relative position, nature of similarity, implications
	"Shanghai and Savannah have similar locations on their continents; both have occasional hurricanes."	
Pattern	non-random arrangement of features	ID and size/direction of pattern, fidelity to "ideal" pattern
	"The towns are arranged like beads on a string, following the route of the old Indian trail."	
Association	regularly occurs together with another feature	ID and map of associated feature, strength of association
	"This disease tends to occur in places where fields are flooded more than four months of the year."	

Each mode of spatial reasoning is an example of what psychologists call a schema – a kind of mental organizational tool that allows a person to make a few observations, apply the schema, and draw a number of valid inferences. Here is a simple example of a schema – suppose I know that the stops on the Lake Street line transit line in Chicago are 8 blocks, with each block having a range of 100 house numbers. If the last stop was 4000 west, and this one is 4800, then I need to get off the train at the next stop in order to be close to a house numbered 5680. In effect, I am applying an 8-block schema in order to avoid having to memorize the subway stop closest to every numbered house. A similar schema works, but not nearly as well, on the Upper East Side of Manhattan, where the subway stops are spaced fairly well (59, 68, 77, 86, . . .) but the streets do not have the same zero-line for their numbering system. It doesn't work at all in parts of Tokyo, where the buildings are numbered according to their date of construction rather than distance from a zero line. In short, a spatial schema is like any other tool – an expert chooses to use it in places where it is known to be useful.

That, in a nutshell, is what is meant by expertise – knowledge of how to use a tool, when to use it, and where to use it. As the old joke goes, to a child who has just picked up a hammer, the whole world looks like a nail! An apprentice carpenter has learned when and where to use a hammer, and an expert carpenter knows what kind of hammer to use in order to do a specific job correctly with the least effort.

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abs: "Memory . . . consolidation can occur extremely quickly if an associative "schema" into which new information is incorporated has previously been created."

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