

Knowledge Representations in Instruction and Assessment:

Striving for Perceptual Enhancement while Avoiding Perceptual Shock

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Overheads for discussion of *Knowledge Representation in Assessment*.
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1. The man with asthma is in room 101.
2. Mr. Alex has cancer.
3. Mr. Osborne is in room 105.
4. Mr. Wilson has TB.
5. The man with mono is in room 104.
6. Mr. Thomas is in room 101.
7. Mr. Wilson is in room 102.
8. One of the men has epilepsy.
9. One of the patients is in room 103.

What disease does Mr. Young have?

<u>Name</u>	<u>Disease</u>	<u>Room</u>
Thomas	Asthma	101
Alex	Cancer	
Osborne		105
Wilson	TB	102
	Mono	104

Medicine Dosages - List Format

Inderal - 1 tablet 3 times a day

Lanoxin - 1 tablet every a.m.

Carafate - 1 tablet before meals and at bedtime

Zantac - 1 tablet every 12 hours (twice a day)

Quinaglute - 1 tablet 4 times a day

Coumadin - 1 tablet a day

Medicine Dosages - Matrix Format

	Breakfast	Lunch	Dinner	Bedtime
Lanoxin	X			
Inderal	X	X	X	
Quinaglute	X	X	X	X
Carafate	X	X	X	X
Zantac		X		X
Coumadin				X

Moths and Butterflies

A moth has two sets of wings. It folds the wings down over its body when it rests. The moth has feathery antennae and spins a fuzzy cocoon. The moth goes through four stages of development.

A butterfly also goes through four stages of development and has two sets of wings. Its antennae, however, are long and thin with knobs at the ends. When a butterfly rests, its wings are straight up like outstretched hands.

Moths and Butterflies

I. Moths

- A. Wings - two sets
- B. Rest - wings folded
- C. Antennae - feathery
- D. Cocoon - fuzzy
- E. Development - four stages

II. Butterflies

- A. Development - four stages
- B. Wings - two sets
- C. Antennae
 - 1. Long
 - 2. Thin
 - 3. Knobs at ends
- D. Rest - wings straight up

Moths and Butterflies

	<u>Moths</u>	<u>Butterflies</u>
Wings:	Two sets	Two sets
Rest:	Wings over body	Wings outstretched
Antennae:	Feathery	Long, thin, with knobs
Cocoon:	Fuzzy	
Development:	Four stages	Four stages

Fish fall into one of three social groupings: solitary, small, or school. Solitary fish do not socialize with other fish. Examples of solitary fish are the Hat and the Arch. Although the Hat and Arch are both solitary fish, they differ in several ways. The Hat swims at depths of 200 feet, whereas the Arch swims 400 feet below the surface. The Arch is 45 cm in length; the Hat is 30 cm. The Hat is a black color and eats shrimp. The Arch is blue and eats krill.

Fish in small groups also vary. They swim at depths of 200 feet like the Lup or at 600 feet like the Tin. The Lup is 30 cm, eats shrimp, and is brown. The Tin is 70 cm, eats prawn, and is yellow.

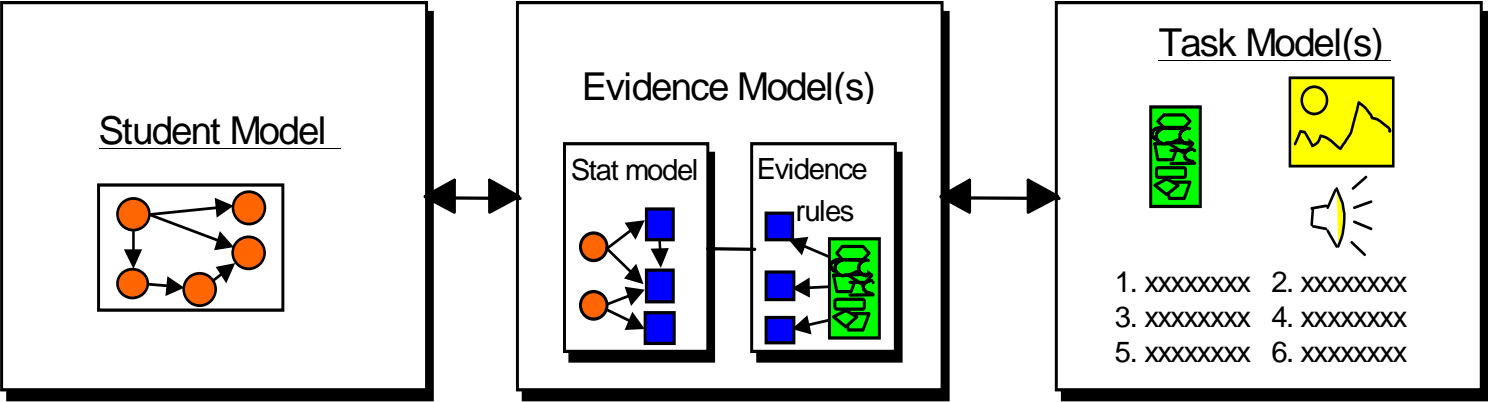
Fish in schools vary along different dimensions. The Bone, for example, is 45 cm and swims at 400 feet. In contrast, the Scale is 70 cm and can be found at 600 feet. The Bone is orange and eats krill, whereas the Scale is white and eats prawn.

Thus, it can be seen that fish which belong to various social groups are quite diverse with respect to size, color, depth, and diet.

- I. 200 ft
 - A. Hat
 - 1. Social group - Solitary
 - 2. Color - Black
 - 3. Size - 30 cm
 - 4. Diet - Shrimp
 - B. Lup
 - 1. Social group - Small
 - 2. Color - Brown
 - 3. Size - 30 cm
 - 4. Diet - Shrimp
- II. 400 ft
 - A. Arch
 - 1. Social group - Solitary
 - 2. Color - Blue
 - 3. Size - 45 cm
 - 4. Diet - Krill
 - B. Bone
 - 1. Social group - School
 - 2. Color - Orange
 - 3. Size - 45 cm
 - 4. Diet - Krill
- III. 600 ft
 - A. Tin
 - 1. Social group - Small
 - 2. Color - Yellow
 - 3. Size - 70 cm
 - 4. Diet - Prawn
 - B. Scale
 - 1. Social group - School
 - 2. Color - White
 - 3. Size - 70 cm
 - 4. Diet - Prawn

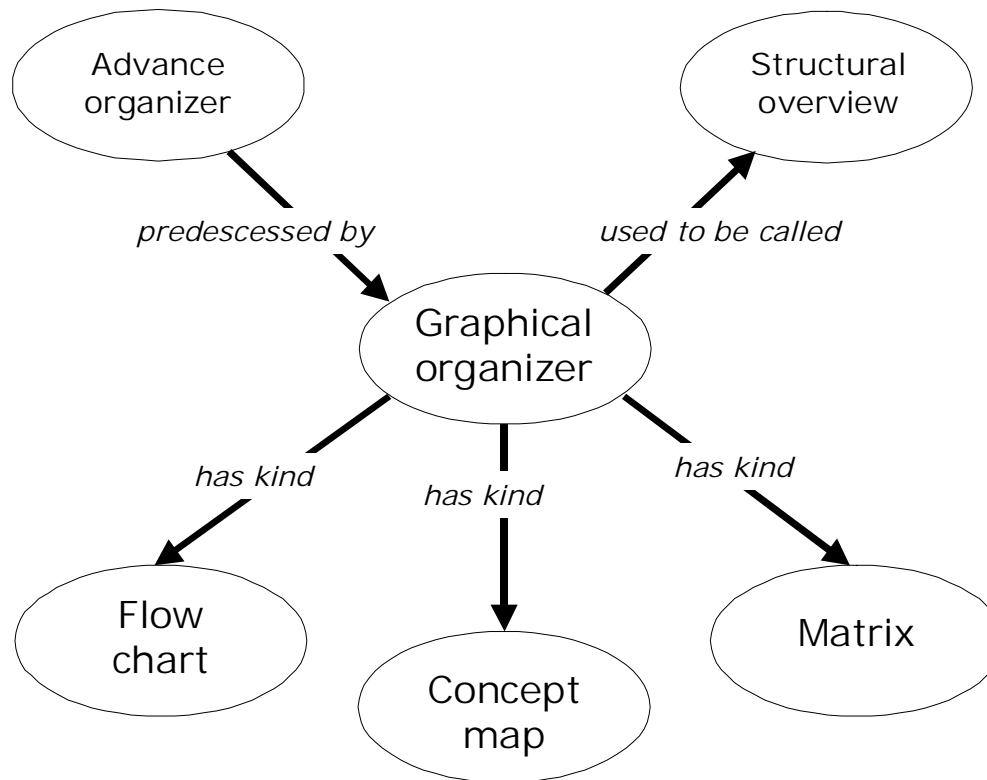
Depth:	200 ft.		400 ft.		600 ft.	
Fish:	Hat	Lup	Arch	Bone	Tin	Scale
Social Grouping:	Solitary	Small	Solitary	School	Small	School
Color:	Black	Brown	Blue	Orange	Yellow	White
Size:	30 cm		45 cm		70 cm	
Diet:	Shrimp		Krill		Prawn	

Mislevy's examples...



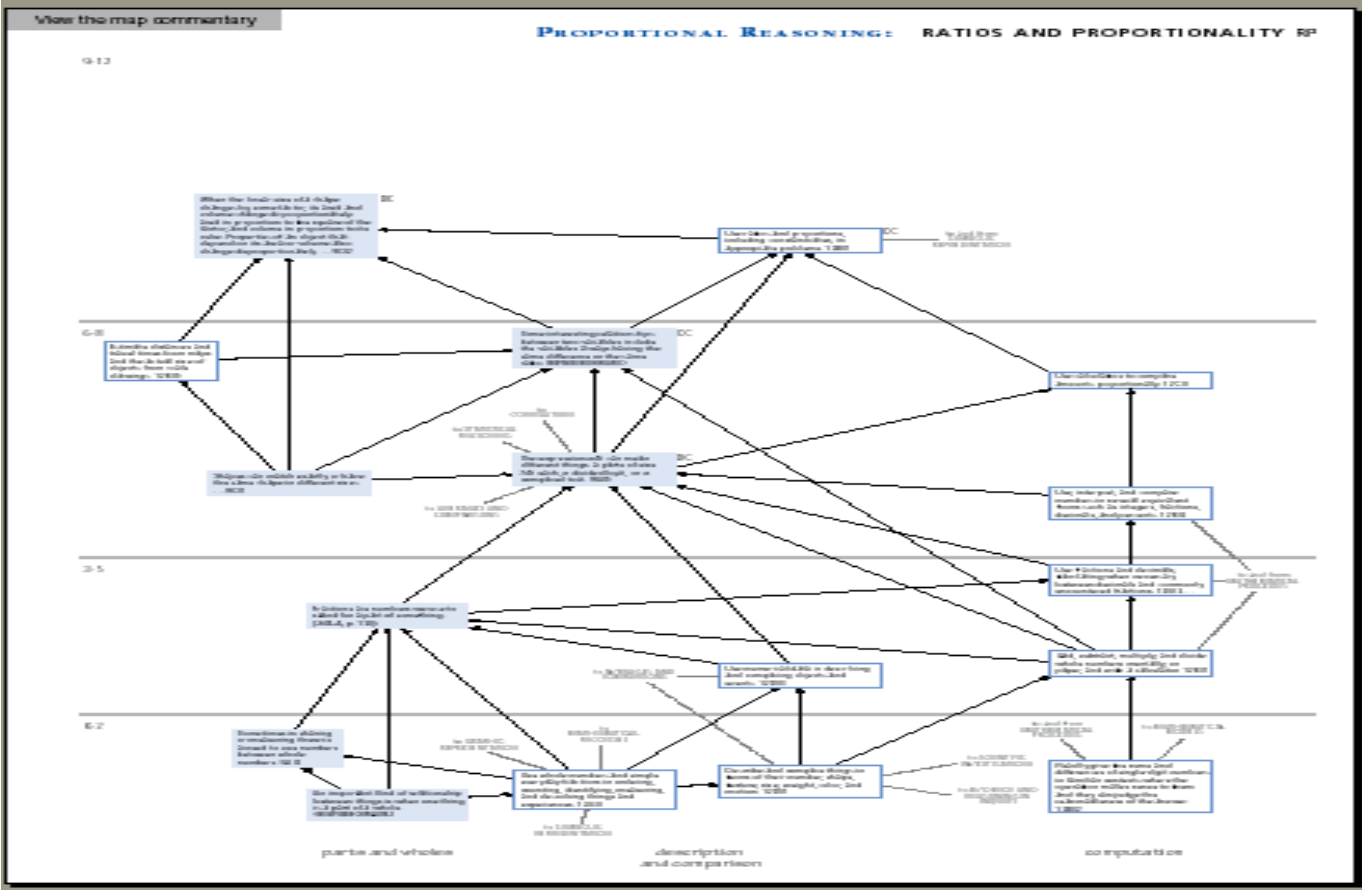
...look similar to concept maps.

From Kester, Kirschner, & Merrienboer (in press) - adapted from Robinson (1998)



And the examples provided by Levy, Kroopnick, and Frezzo...

...may cause what Blankenship and Dansereau (2000) called “map shock”



Can We do Better with Knowledge Representations that are used in Assessment?

There is but one purpose why people create visual displays: to communicate. We need a book on visual display that at least implies 'The purpose of display is comparison (recognition of phenomena) not numbers.' Much of what we want to know about the world is naturally expressed as phenomena - - as potentially interesting things that can be described in non-numerical words.

Tukey (1990)

The greatest possibilities of visual display lie in vividness and inescapability of the intended message. A visual display can stop your mental flow in its tracks, and make you think. A visual display can force you to notice what you never expected to see. One should see the intended at once; one should not even have to wait for it to appear.

Tukey (1990)

KRs are useful when they **highlight** important relationships and make them **easier** to work with.

They **facilitate** analogies across problems and domains.

They make it **easier** to acquire and structure information. (mediating cognition)

They can **facilitate** working together. (distributing cognition)

They are **significant** in planning.

How can we assess this?

Design studies to evaluate these claims.