Spatial Perspectives on Analysis for Curriculum Enhancement

Hosted By:

Pedagogy in Undergraduate Teaching and Learning

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Thinking about Curriculum Development and Improvement

My job:

- introduce some basic principles of teaching and learning that can help to guide your ideas with respect to your curriculum

Other instructors will:

- help you gain skills with spatial analysis technologies and prepare materials that you can use in your courses
- Provide advice about what works in a spatial learning context, and what some obstacles might be

Your job:

- combine
    - the **inspiration** you already have
    - the **new ideas** you develop today and throughout the workshop
    - your new **technical skills**

  to do groundbreaking curriculum development in the area of spatial thinking in the social sciences

Available Resources for Instructional Development

- SPACE website
- SPACE library resources available this week
- Instructors with experience integrating spatial thinking into their curricula
- Instructional development office at your campus
- Fellow workshop participants

Good Beginnings

What are some things that you do at the **beginning of each course or module** to ensure that the **course runs smoothly** and so help students learn as **effectively** and **efficiently** as possible?

Good Beginnings

- Norm-setting activity: small groups
  - Expectations of selves, each other, instructor
  - Guidelines about instructor expectations
- Students establish learning goals
  - Mid-quarter evaluation involves reflection on achievement of goals
- Role-playing to encourage spatial thinking
  - Take on planning identity on project
  - Map a vision
- Baseline diagnostic tool: what do students know?
- Class experiment: play tape with ambiguous computer-generated sound, and students engage in decision making regarding origin of sound
- Establish key themes that learning will be centered around, e.g., space, place, region, culture
- Students interview each other and introduce each other to find out common and unique interests, resources, etc.
- One student describes visual representation that others should try to draw,
- Draw mental map of route from home to campus, compare with another at end of course

The Science of Learning

- Focus on the **process** of knowing
- Contemporary view: people construct new knowledge and understanding **based on what they already know and believe**
- Extremely important to consider **prior knowledge** when designing learning activities
  - possession of **necessary background knowledge**
  - possession of **misconceptions**

Students' preconceptions

- From NRC report on "How People Learn"
  - *"Students come to the classroom with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp the new concepts and information that are taught, or they may learn them for purposes of a test but revert to their preconceptions outside the classroom."*
- One of the strongest principles to emerge from the study of learning
- Contrast with '**empty vessel**' model of learning
- One implication for teaching: assessment that goes **beyond testing and grading**

Experts and novices

What are the most important **differences between expert knowledge and novice knowledge** in your discipline?

In other words, what **fundamental properties of knowledge** do we need to consider when trying to help students make the transformation from novices to experts?

Experts and novices

- Experts
  - See space as a process, not just as a container
  - Engage in empirical observation
  - Already have schema into which to build knowledge
  - May devalue other knowledge that novices bring to discussion
  - Sometime just know jargon, or focus on their own jargon
  - Best able to deploy certain types of discourse
- Novices
  - See space as a container
  - Focused on factoids, don't see relationships between facts
  - Knowledge more an impression rather than based on experience
  - Embodied sense of space or place

Appealing idea

If we can identify what an expert knows about a topic, instruction can be thought of as a method for transferring the content of the expert's knowledge base to the novice.

Appealing **(but inadequate)** idea

If we can identify what an expert knows about a topic, instruction can be thought of as a method for transferring the content of the expert's knowledge base to the novice.

Problem: It's not that simple! Content is only part of what makes up an expert's knowledge.

Beyond content

What is there beyond content?

Why is it that "*novices see only what is there; experts can see what is not there*"?

Beyond content

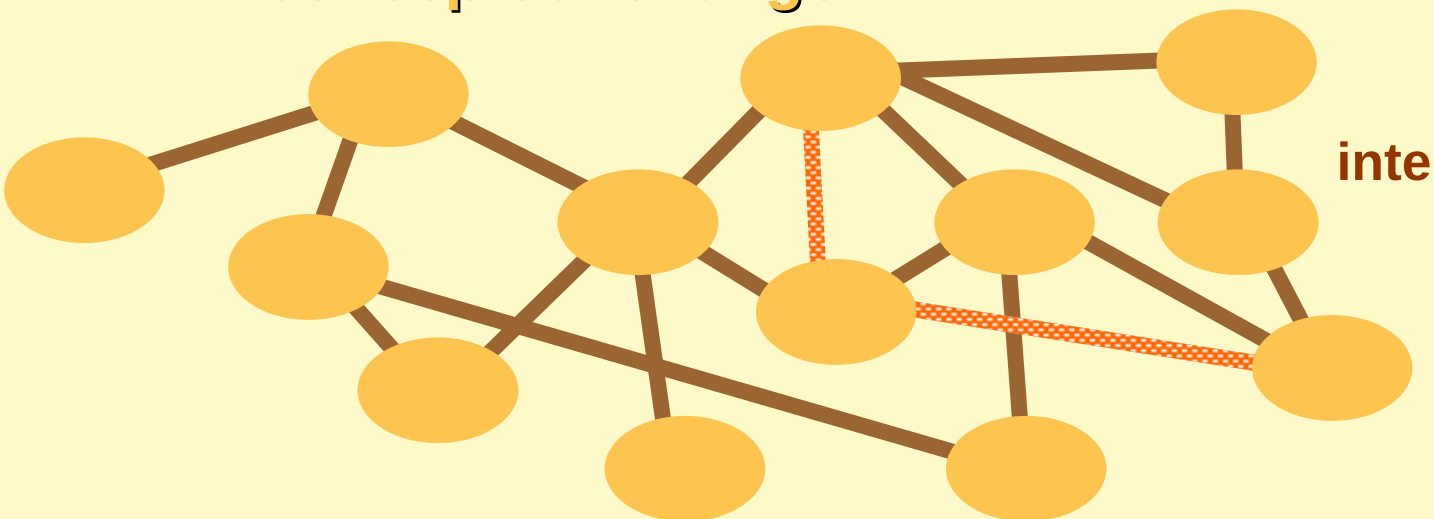
What is there beyond content?

Why is it that "*novices see only what is there; experts can see what is not there*"?

The expert's knowledge is **structured** around the fundamental principles of the discipline.

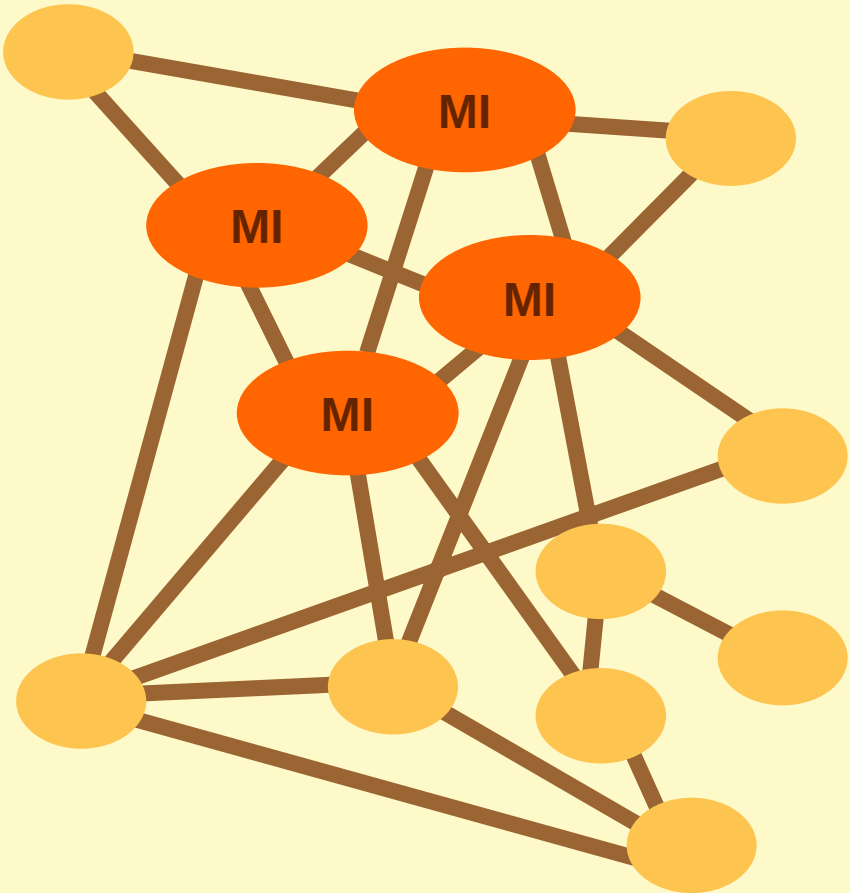
Cognitive theory that can be a useful starting point when designing instructional materials

- Knowledge has structure, and can be thought of as a semantic network.
  - both declarative and process knowledge
- Learning can be considered as active knowledge building, whereby individuals add to their knowledge structure.
  - knowledge enrichment
- Learning can also occur through modification of existing (but inadequate) structures.
  - conceptual change



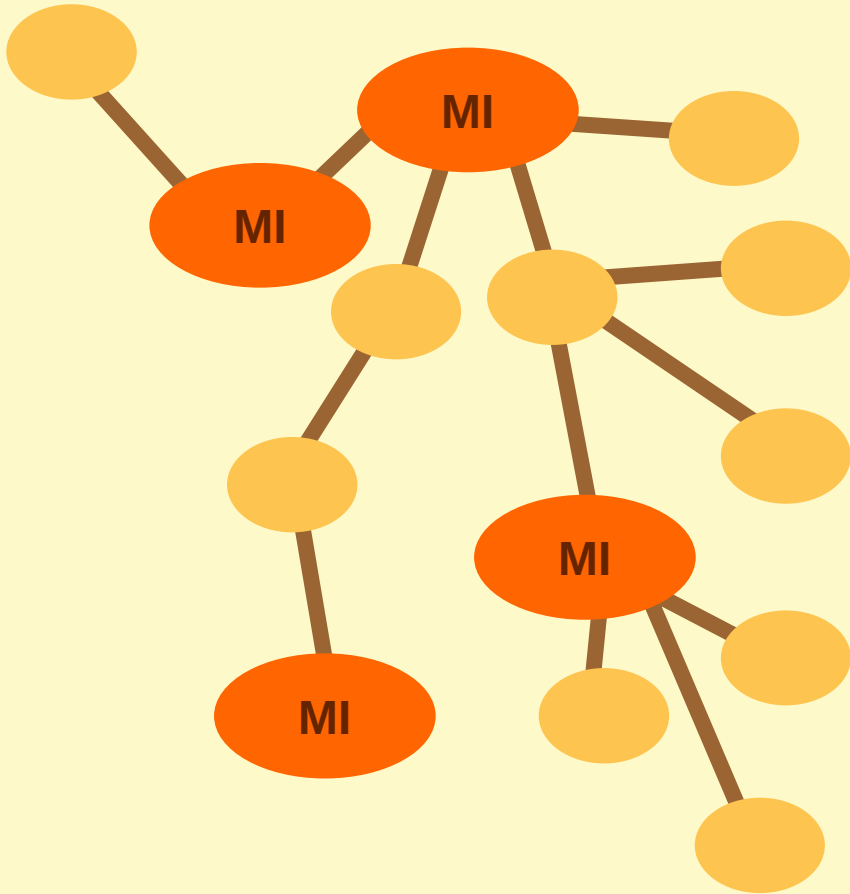
interconnectedness important

Cognitive theory that can be a useful starting point when designing instructional materials



a model of expert knowledge structure

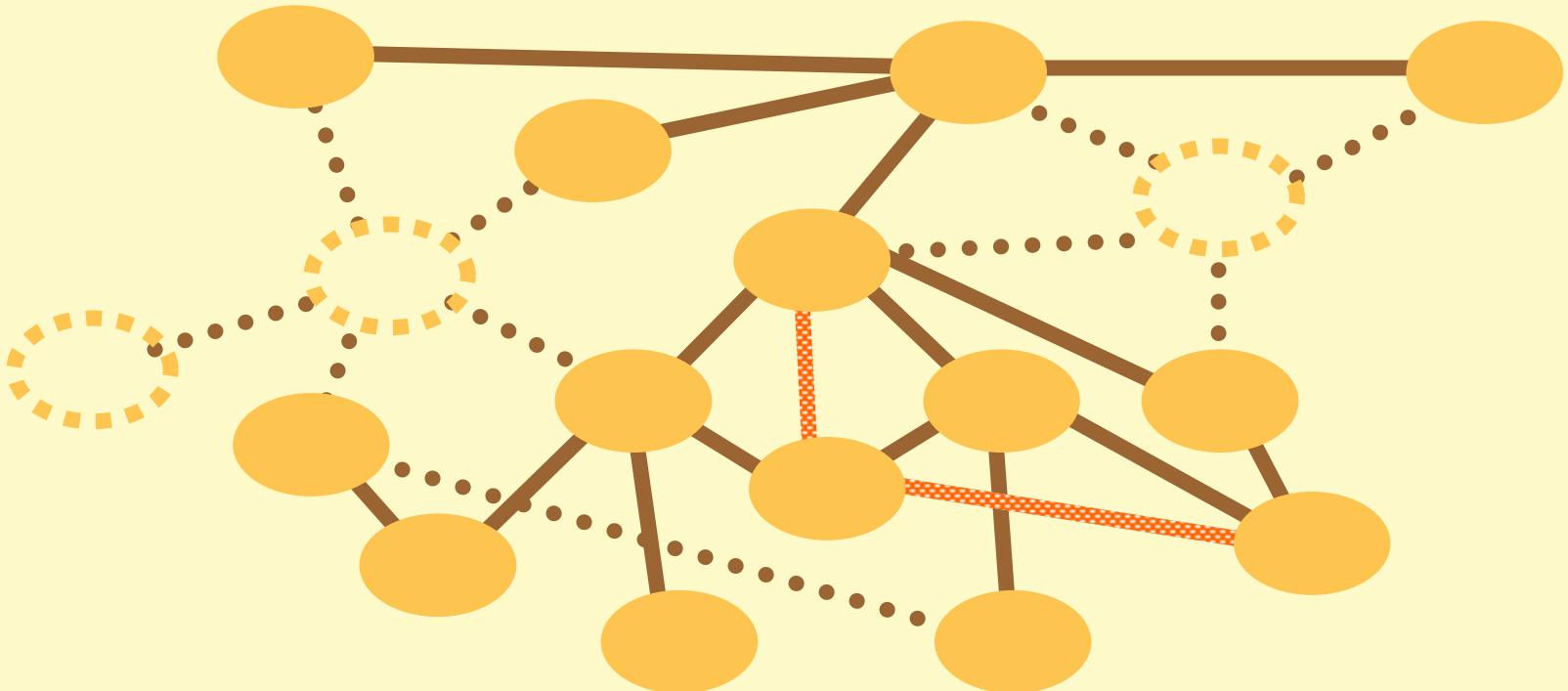
interconnection important



a model of novice knowledge structure

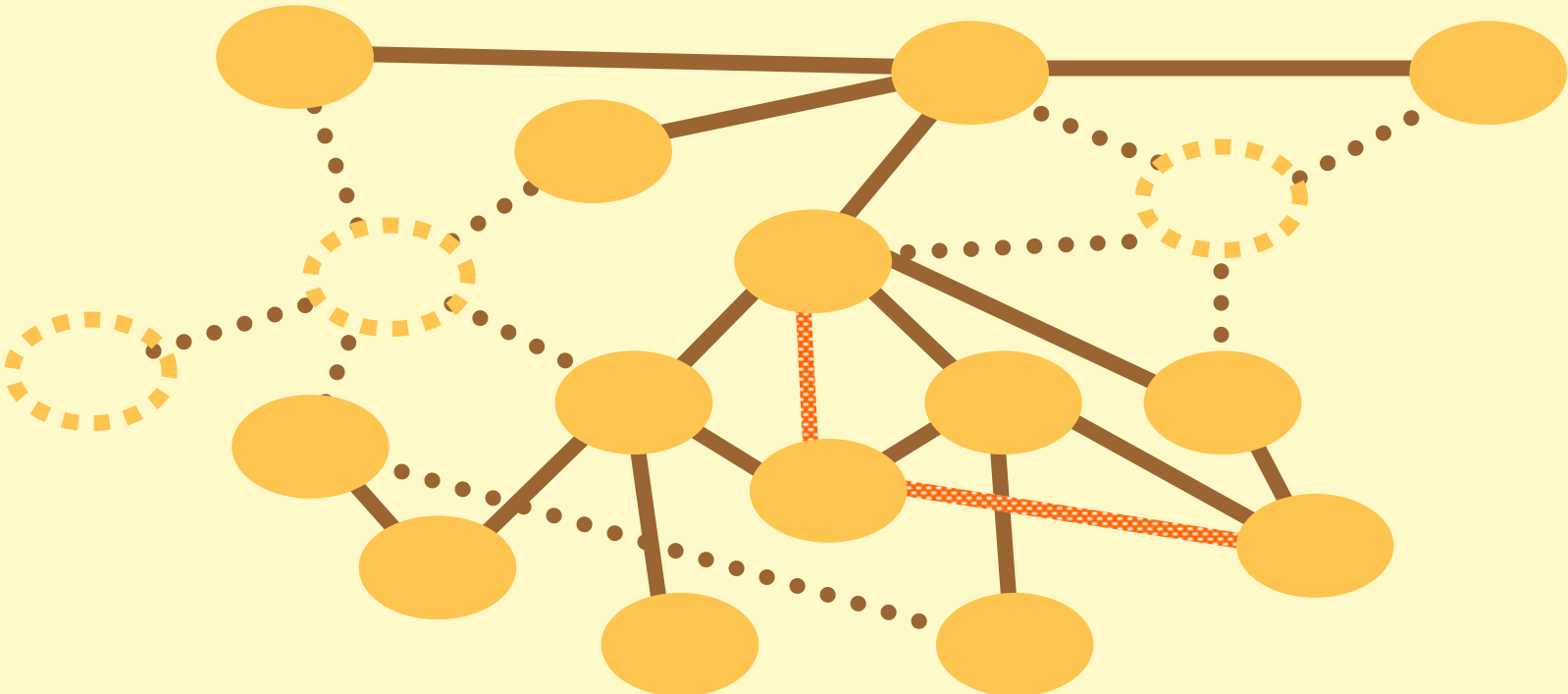
Some barriers to learning that can be mitigated through instructional design

- Limited prior knowledge
  - Learning occurs most easily when students have relevant anchor points in current knowledge structure.



Some barriers to learning that can be mitigated through instructional design

- Preconceptions about subject matter
  - It requires greater effort to change an inadequate mental model (especially one constructed based on personal experience) than it does to add new components to an existing model.



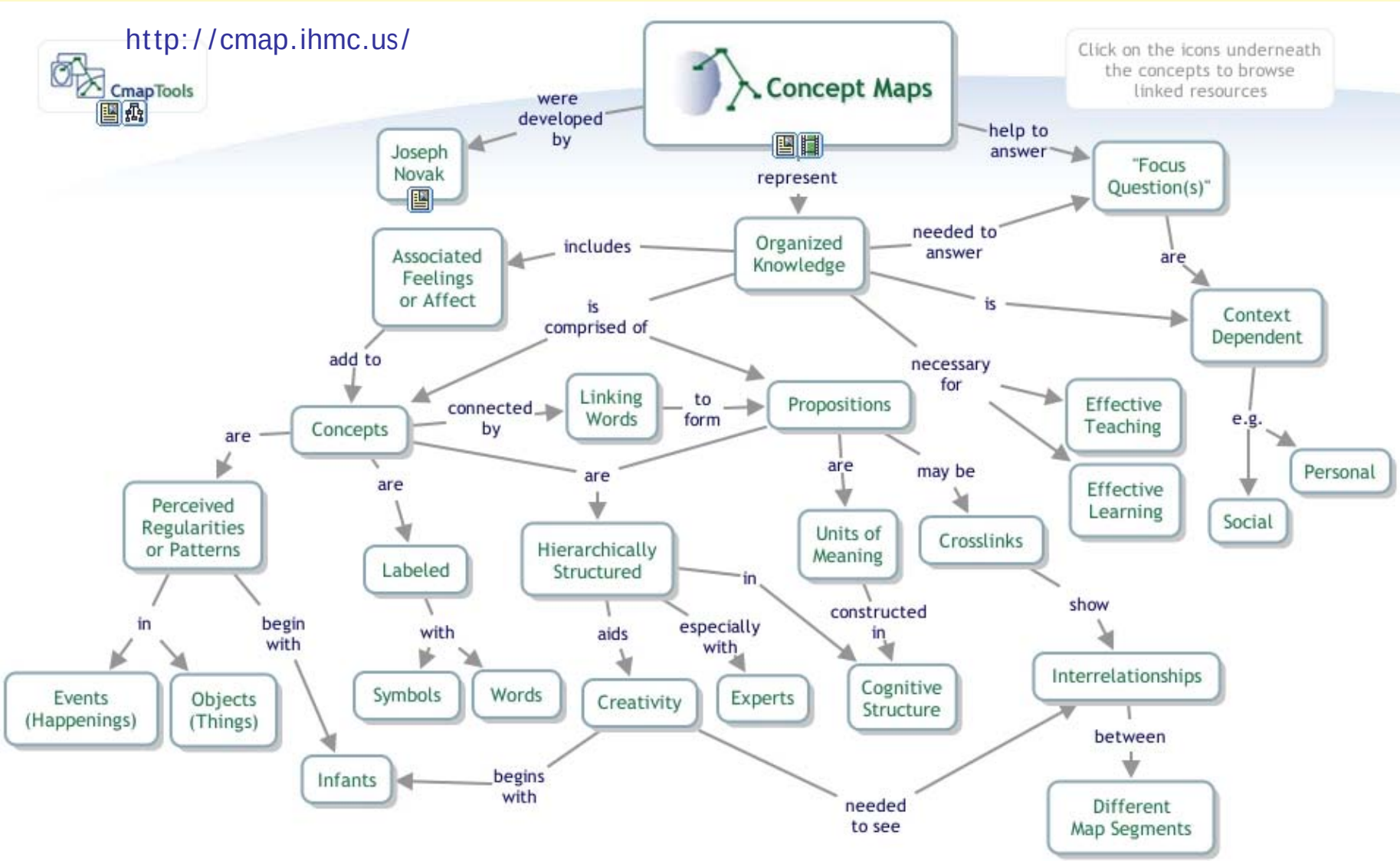
Advantages of teaching and providing practice with both content and structure

- Research shows that learners with well-structured knowledge:
  - Incorporate new information more quickly
  - Search more efficiently
  - Recognize patterns that lead to solutions
  - Find it easier to apply knowledge to novel domains and problems
  - Have ability to see typicality, distinctions, and antecedents and consequences
- On the other hand, poorly-structured knowledge is often inert and can only be applied under very specific conditions.

Practical strategies for illustrating the structure of knowledge to students

- Verbal clues when lecturing:
  - "for example", "on the other hand", "similarly"
  - outline (but keep in mind that not all structure is hierarchical and linear)
  - focus on "story line" or "plot"
- Diagrams and "concept maps"
  - pictorial, non-linear, allow visual depiction of non-hierarchical relationships between ideas

Concept Maps



- especially effective when constructed by learners

Practical strategies for illustrating the structure of knowledge to students (cont.)

- Comparative organizers/incomplete matrices
  - Pro-con grid

	Pro-construction	Con-construction
Effect on renters		
Effect on property owners		
Effect on ecosystem		

  - Theory comparisons, etc.

Practical strategies for illustrating the structure of knowledge to students (cont.)

- Example, analogy, and metaphor
  - use with caution, however
- Self-explanations and self-questioning
  - Inventory of questions on handout
- Anchored instruction through case studies
  - approaching same problem from multiple perspectives

Whichever approach chosen, **feedback** on both content and structure is necessary.

A good set of principles to think about when designing curricula

- Emphasize a few key ideas
- Be aware of prior knowledge
- Tap into motivational sources
- Build structural knowledge to achieve understanding
- Structure learning to support encoding of the content
  - "scaffolding"
- Use modeling to teach skills
- Give lots of active, coached practice
- Teach in ways that promote transfer
- Help students become aware of their own learning strategies
  - metacognitive strategies, self-reflection
- Respect individual differences in learning

These principles, and much of the content of this presentation adapted from Svinicki, M.D. (2004). *Learning and motivation in the postsecondary classroom.* Bolton, MA: Anker.