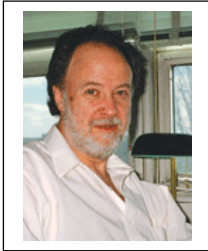


# Rand Spiro – Cognitive Flexibility Theory

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## **Field/Interests**

- Knowledge acquisition in complex domains
- Medical cognition
- Hypermedia computer technologies for learning
- constructive processes in text comprehension and recall.

## **Theory Overview**

Cognitive Flexibility theory is a conceptual model for designing learning environments based on cognitive learning theory. Spiro and Jehng (1990) defined cognitive flexibility as “the ability to adaptively re-assemble diverse elements of knowledge to fit the particular needs of a given understanding or problem-solving situation” (p. 169). This theory focuses on learning in complex and ill-structured domains – which represent most situations in real life.

## **Major principles of Cognitive Flexibility Theory:**

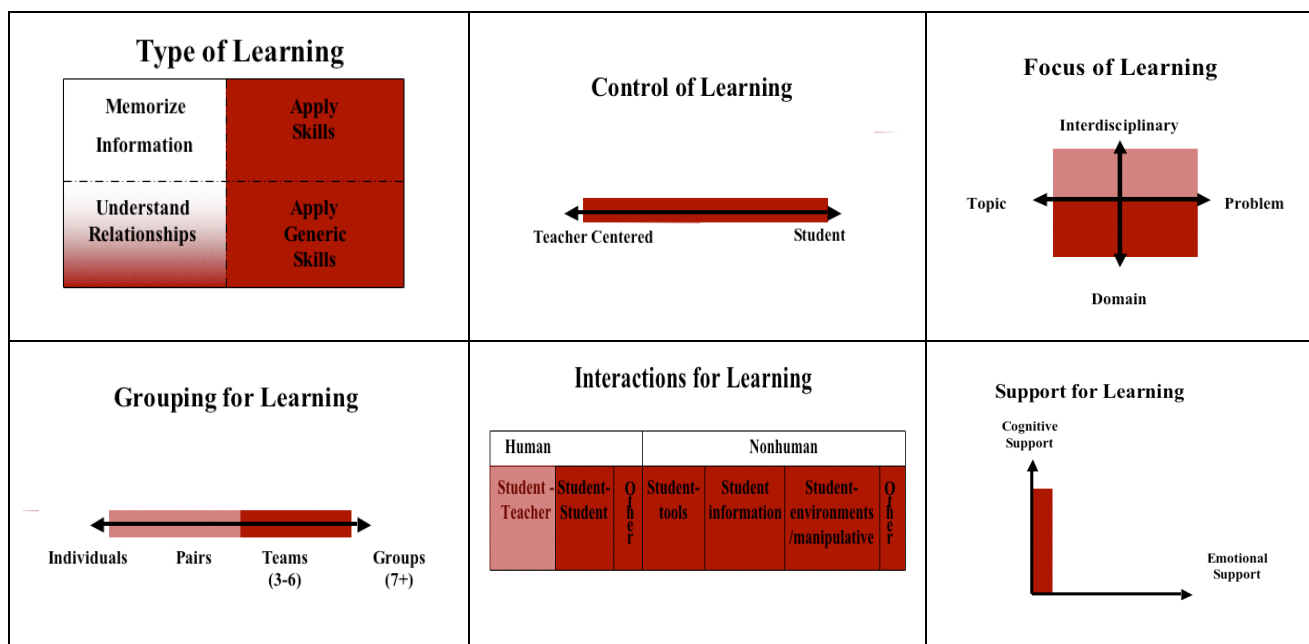
1. Instructions should avoid oversimplification
2. Learning activities must use multiple representations of the content
3. Emphasis on case-based instruction
4. Advanced knowledge must be acquired in a real-world context
5. Emphasis on knowledge construction (not transmission of information)
6. Knowledge sources need to be highly interconnected rather than compartmentalized.
7. Although this theory can be used in lower levels of learning, it is generally focused on advanced knowledge acquisition (particularly in the use of hypertext).

## **Theories that share similar characteristics/principles:**

- **Constructivist theory (Bruner)** – students should be encouraged to “construct” their own knowledge and build upon what they have already learned; instruction should be designed to encourage the learner to go beyond the information given.
- **Subsumption Theory (Ausubel)** – instructional materials should integrate new material with previously learned material; New and old ideas should be compared and cross-referenced
- **Genetic Epistemology (Piaget)** – Students develop cognitively when they are presented with new situations that require them to adapt previously learned material

**How CFT differs:** While Cognitive Flexibility Theory uses many of the same ideas as other constructivist theories, its emphasis is on ill-structured domains, case-based instruction, and generally higher-level learning. It also seems to give more emphasis to authentic contexts.

### Reigeluth's Comparison Framework



### Cognitive Flexibility Theory in Relation to Hypertext/Hypermedia:

Hypertext refers to “computer-based texts that are read in a non-linear fashion and that are organized on multiple dimensions” (Spiro and Jehng, p.167). Participants can view the same material (text, pictures, video, audio) in different ways, essentially creating their own paths. The use of hypertext is a practical way to review the ideas of other people and record your own ideas about ill-structured and complex content/problems. Spiro and Jehng (1990) argue that current debate on hypertext is far too concerned with data access and too little concerned with theory. They also state that nonlinear instruction used in simple knowledge domains may place an unnecessary additional cognitive load on learners. Hypertext is best suited for advanced learning, where participants can apply, evaluate and synthesize their learning in a changing environment.

### Examples of Applicable Instructional Designs

#### 1. *Medical studies*

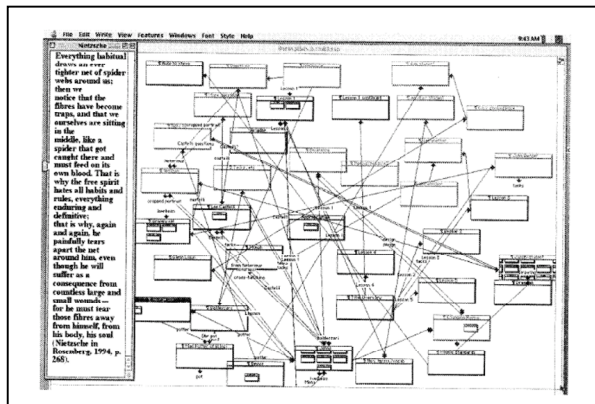
I thought of Marisa's case study when I read about this one. Jonassen, Ambruso & Oleson (see references: Cognitive Flexibility Theory) describe a hypertext program on transfusion medicine where several difficult clinical cases are provided. Students are required to diagnose and treat these cases using various sources of available information. The learning environment is ill-defined and complex, presents multiple perspectives and emphasizes construction of knowledge.

#### 2. *Teacher Education*

Cunningham (n.d.) describes a method of teacher education, which involves case-based learning that encourages the pre-service teacher to begin thinking like an expert teacher. Cunningham states that a case-study approach to teacher education “bridges the gap between theory and practice” (p. 1) by getting students actively involved in analyzing and interpreting scenarios that they can revisit numerous times. Instead of presenting tidy scenarios with only one right answer, the proposed instruction provides more authentic, “messy”, complex problems that, upon analysis, present multiple solutions.

### 3. *Exploring Art History and Art Criticism*

A qualitative study was done by B. Stephen Carpenter (formerly of ODU) and Pamela G. Taylor on how the use of a hypertext program like “Storyspace” could be used to explore the meaning behind a piece of artwork. The authors used the web-type structure below to record and link their thoughts, playing off each other. They could also include pictures, video and audio to their Storyspace boxes. They found that examples from multiple disciplines and perspectives often served as important contributions in the process and concluded that this web structure could continue on indefinitely, with thoughts and examples being added by other participants (Carpenter and Taylor, 2003). The authors have also experimented with Storyspace as a tool in developing themes and unit plans in art education classes (Taylor and Carpenter, 2002).



Example of *Storyspace* web (carpenter and Taylor, 2003)

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