E19.2015
Representation and Interaction Design

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Overview

Information Design
- Aspects to Consider
- Theoretical Foundations

Design Activity
Information Design

Aspects to Consider

- Data Types
- Affordances & Constraints
- Cognitive Processing of Information
- Emotional Processing of Information
Information Design: Aspects

Data Types

- 1D Linear
- 2D Map
- 3D World
- Multidimensional
- Temporal
- Tree
- Network

Tasks

- Overview
- Zoom
- Filter
- Details-on demand
- Relate
- History
- Extract

Shneiderman & Plaisant, 2005
Information Design: Aspects

Example

BLOOM'S TAXONOMY - LEARNING IN ACTION

- Match
- Restate
- Explain
- Define
- Distinguish
- Paraphrase
- Rewrite
- Summarize
- Give Example
- Express
- Interrelate
- Interpret
- Illustrate
- Extend

Comprehension

Valuing Conclusion
- Self-evaluation
- Survey
- Recommendation
- Court Trial
- Self-assessment
- Analysis
- Synthesis
- Assumptions

Application
- Exercise
- Practical Application
- Design
- Create
- Organize
- Predict
- Plan
- Plan
- Produce
- Solve

Analysis
- Compare
- Differentiate
- Classify
- Survey
- Inferences
- Synthesize
- Hypothesize
- Evaluate
- Analyze
- Synthesize

Knowledge
- Facts
- Concepts
- Vocabulary
- Information
- Definitions
- Procedures
- Formulas
- Principles
- Methods

Bloom's Taxonomy

- Comprehension
- Application
- Analysis
- Evaluation
- Synthesis
- Knowledge
Information Design: Aspects

Example

Nearly 140 years after the periodic table was introduced, new elements are still being discovered, including one just last week. Numerous redesigns of the table have been proposed: arranging it in triangles, diamonds, spirals, parallel planes and even 3D models. But none have gained the popularity of the traditional table. The most common rearrangements, a spiral, tries to illustrate hydrogen’s relationship to multiple elements and to integrate a block of elements known as lanthanides and actinoids. The design below, by Jeff Moran of Woodstock, N.Y., serves as the basis of an interactive Web-based program that allows users to explore the elements and their interplay.

DAVID CONSTANTINE

THE PERIODIC SPIRAL

Both are organized by each element’s atomic number and into three groupings called blocks, groups and periods.

In the periodic table, one square equals one element.

In the periodic spiral, one hexagon equals one element.

Reading order

Start

Left to right, top to bottom

From center, spiral out clockwise.

Blocks: 4 groupings (colors) by elements’ outermost electron shell configuration.

Lanthanides and actinoids

Groups: 18 groupings according to elements’ chemical reactivity.

Periods: 7 groupings (K-Q) of elements with the same number of electron shells

Numbered diagonally toward center

Each spiral is a period.

Ununoctium discovery reported last week

HYDROGEN, HELIUM, ALOKAL METALS AND ALKALINE EARTH METALS

Sources: Jeff Moran, Electric Prism Inc.; Dr. Mark K. Leach, www.metasystems.com; Philip Stewart

O. Theodor Berkey, 1960

Edgar Longman, 1951

www.periodic spiral.com

The New York Times
Information Design: Aspects

Example – BBC History
What are tasks that are most relevant for educational content?

What could inform the selection of such tasks?
Information Design: Aspects

Examples

- Hans Rosling @ TED
- The brain
- ThinkMap/Visual Thesaurus
Information Design: Aspects

Norman’s Design Cycle
Information Design: Aspects

Norman’s Design Cycle

- Goals
- Execution
- Evaluation
Norman’s Design Cycle

- Goals
  - Convergence between designer and user

- Execution
  - Conceptual Models [example]
  - Affordances
  - Constraints

- Evaluation
  - Feedback
Information Design: Aspects

Affordances
Norman’s Design Cycle

- Goals
  - Convergence between designer and user

- Execution
  - Conceptual Models [example]
  - Affordances
  - Constraints

- Evaluation
  - Feedback
Information Design: Aspects

Norman’s Design Cycle

Constraints

- Physical constraints
- Semantic constraints
- Cultural constraints
- Logical constraints
Information Design: Aspects

Norman’s Design Cycle

- Goals
  - Convergence between designer and user

- Execution
  - Conceptual Models [example]
  - Affordances
  - Constraints

- Evaluation
  - Feedback
Information Design: Aspects

Norman’s Design Questions

- How easy is it to
  - determine the function?
  - tell what is possible?
  - determine mapping from intention to action?
  - perform the action?
  - tell what state the system is in?
  - determine mapping from system state to interpretation?
  - tell if system is in desired state?
Information Design: Aspects

Norman’s Principle for Usable Design

- Visibility – making visible the invisible to improve usability
- Natural mapping, constraints – limit possibilities, less to remember
- Provide feedback: immediate visual, auditory outcome
Information Design: Aspects

Cognitive Processing of Information
Information Design: Aspects

Cognitive Processing of Information

- Construction of mental representations
- Depictive v. descriptive representations
- Multimedia Learning Principles
Cognitive Processing of Information

Construction of mental representations

Fig. 2. An integrated model of text and picture comprehension.
Information Design: Aspects

Theoretical Foundations
Information Design: Aspects

Theoretical Foundations

- Cognitive Load Theory
- Cognitive Theory of Multimedia Learning
- Schnotz’ Integrated Model of Text & Pic Comprehension
- Dual Coding Theory
- Media Attribute Theory

Provide foundation for ID evaluation
Design Activity

Instructional Information Design Task

- Design an interface for a learning tool that:
  - allows users to browse blogs of groups of people (e.g., students in a class),
  - displays entries by topic, time uploaded, or popularity
  - allows adding private or public notes for each entry
  - allows adding pictures for each entry

- Describe how you would evaluate such an interface.