Insights of Systems Theory as Applied to Web-based Training

Tutorial T4 – Notes for Section 1
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1. Cognitive science and designing

A better understanding of designer/writer cognition can help improve the design of web-based training environments.

1.1 Introduction

What is design?

The accomplishment of design tasks appears, on the surface at least, to defy empirical analysis. There are many tacit skills involved in expert designing so it may be difficult to determine how each skill is involved in masterful design. For example, an architect must balance many factors when generating ideas for a building. The architect must consider the lot geography, colors in the environment around the new building, the customer's wishes, his or her own capability and personal style, as well as other technical and artistic factors, in order to produce a novel and successful design. How does the architect mix these factors together and generate new design ideas?

Which design skills are important for the development of WBT?

Think of the architect description above... geography, environment, customer, style...

How can improving design skills improve WBT?

Some interesting scientific views of designing:

- Complex creative process
- Generative problem-solving skill
- Writing as a design skill
- Cyclical process of design

1.2 Design as a complex creative process (Schoen, 1987)

- Best learned through coached practical experience
- Controlled studio-like environment
- Productive designers must develop fast-paced design intuitions
- Reflective evaluation and improvement of design skills

- Acid-testing of designs (real-world feedback)

Example with WBT (how would one go about these steps?)

1. Schoen evaluates architecture, musician, and psychoanalyst training
2. Reflective practice appears to be the key to these arts, all with attributes of design.
3. Read examples from Schoen's book for each element (esp. Psych)
4. Correlation with WBT

1.3 Design as generative problem-solving skill (Goel & Pirolli, 1992)

Difficult skill must both generate functional designs and solve real problems

- Easy to have great, elegant designs that don't work (DaVince...)
- Challenge is to be elegant AND effective, that is the art of design
- Analytical problem-solving design strategy
- Helps reduce attentional load
- Works with complex design problems
- Uses ends-before-means design approaches (ADDIE, etc.)

A Study of characteristics of design-like activities

1. Extensive problems structuring
2. Distinct problem-solving phases (a stable design process)
3. Reversing the direction of the transformation function (modifying objectives or customer expectations in line with possibilities and constraints emerging during the design process)
4. Near decomposibility of design solutions (analysis of options)
5. Incremental development of design solutions
6. Flexible, generative, rapid-prototyping style "limited-commitment-mode" control strategy (when new modules are begun before prior modules are completed).

Examples (from G&P)

Reversing direction of transformation function, dialogue on p. 418 of G&P

1.4 Writing as a design skill

G&P identified writing as a design skill (possesses common attributes with architecture and other design skills)

Writing also a key skill in WBT content development

Extensive cognitive research into writing sheds light on design processes

Cognitive writing process research (Flower/Hayes diagram)

- Goals based on task/audience
- Objectives

- Idea generation
- Idea organization
- Writing plan
- Drafting
- Revision

Novice v. expert writing
- Novice follow verbal patterns
- Experts utilize complex processes and intermediate texts

Key role of literacy in writing
- Knowledge of subject
- Knowledge of writing plans
- Ability to generate text / content

Example

Quote from Rowley, 1997: *As writers gain expertise they first acquire knowledge-telling skills, then over time gain knowledge-transforming writing processes that depend on previously-developed knowledge-telling skills, according to Scardemalia and Bereiter. Without the knowledge-telling skills, or the ability to 'talk on paper', the writer will not be able to translate organized ideas into text. Thus the 'knowledge-telling' process is a writer's basic literacy, and includes the writer's knowledge of genre, mechanics, and styles of writing. This basic literacy is a critical perquisite skill to a more expert 'knowledge-transforming' approach to writing. Expert, or accomplished writers often develop and organize their ideas extensively before and during early stages of writing their drafts. However, during the writing of text they still rely on basic literacy, or 'knowledge telling' capabilities in order to translate their organized ideas into sentences and paragraphs (see Fig.1 for illustration of this role of 'knowledge-telling' skills as foundational elements of the expert 'knowledge-transforming' writing skills).*

Sculpting Metaphor for writing process

Activity: Writing Process Survey (discussion of correlation to design skills)

1.5 Design as a cyclical process (Rowland, 1992)

Rowland studied processes followed by expert instructional designers
A cyclical process favored by practitioners emerged:
1. Review design problems
2. reflect on own experience
3. identify and analyze potential solutions
4. generate design ideas
5. repeat until satisfactory design emerges

This process is consistent with Schoen's research (reflection)
Example

1.6 A design model based on cognitive research

Complex creative process

- Coached practice
- Reflective evaluation

Generative problem-solving skill
- Use of tools to structure problems
- Disciplined problem-solving processes

Writing as a design skill
- Initial designer literacy
- Ability of designer to translate plans into media
- Goal monitoring throughout detailed design processes

Cyclical process of design
- Repeated cycle of review, reflection, hypothetical solutions, design ideas
- Relies heavily on designer literacy

1.7 A cognitive model for designing web-based instruction

Draw from cognitive research into design
Consideration of unique capabilities of the web.

Discussion questions

1. What are the most important stages of design for web-based training?
2. How can designers enhance their design literacy? (Disciplined browsing...etc)
3. How can designers connect design ideas (theirs or clients) with realistic development plans?
4. What types of experiences will help a designer learn how to produce better media?

Activity

Exercise to demonstrate the use of design literacy in web design. (Intentional browsing)

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