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<th><strong>Title</strong></th>
<th>Designing learning environments</th>
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<tr>
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Paper No. 18
Designing Learning Environments

John Hedberg PhD
Interactive Multimedia Learning Laboratory
Faculty of Education
University of Wollongong

Instructional Design

- Instructional Design aims can be described as:
  - improving learning and
  - enhancing courseware authoring efficiency
Multimedia Development

- Phases of Development
  - Initiation
  - Specification
  - Design
  - Production
  - Review and Evaluation
  - Delivery and Implementation

Views of Learning

- Learning is acquiring information or 'knowing a lot'
- Learning is storing information that can be reproduced
- Learning is acquiring facts, skills and methods that can be retained and used as necessary.
- Learning is making sense or abstracting meaning, relating parts of the subject matter to each other and to the real world
- Learning is interpreting and understanding reality in a different way
- Learning involves comprehending the world by reinterpreting knowledge
**Behavioural Views of Learning**

Reinforcement theory is fundamental to behavioural psychology:

- **Thorndike (1913)**
  - Laws of effect and exercise
- **Skinner**
  - Stimulus and response
- **Gagné**
  - Set of instructional events
- **Merrill ID2**
  - Component events which are aggregated

**Information Processing Theory**

Cognitive Scientists support a learner-centred approach to learning via information processing theory:

- **Sensory stimuli**-perceived and stored in STM
  - Acts as a buffer to Long Term Memory with ongoing instruction and prior knowledge.
  - STM is limited and volatile
- **Learning occurs when information encoding**
  - Transfer from STM to LTM
  - Schema (organised networks of prior knowledge)
- **Reigeluth & Curtis and Reigeluth & Merrill**
  - Elaboration Theory as an Instructional Theory
Constructivist Frameworks

- Emphasis on meaningful authentic activities that help learners construct understandings and develop skills relevant to solving problems, thus —
  - Knowledge is constructed, not transmitted
  - Active learning
  - A respect for learners own thinking
  - Emphasis on learners making sense from their world
  - Piaget first introduced the concept and many others have developed the "Constructivist framework"

Contrasting Views of Learning

<table>
<thead>
<tr>
<th>If you think of knowledge as...</th>
<th>Then you think of instruction as...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A quantity of content waiting to be transmitted</td>
<td>A product to be viewed by a vehicle</td>
</tr>
<tr>
<td>A cognitive state selected by a person's schema</td>
<td>A set of instruction strategies aimed at changing an individual's scheme</td>
</tr>
<tr>
<td>A person's meaning is constructed by interaction with the environment</td>
<td>A learner is drawing on stored resources within an environment</td>
</tr>
<tr>
<td>Eductuation of a group's ways of sensing and doing</td>
<td>Participation in communities of everyday activity</td>
</tr>
</tbody>
</table>
Advantages of Directed Instruction (pre-constructivist)

- Familiarity
- Efficiency for precisely prescribed outcomes
- Accountability
- Manageability

Disadvantages of Directed Instruction

- Lack of durability of knowledge
- Compliant cognition (learners evolve the capacity to produce desired responses)
- Functional fixedness (problem solving linked to content),
- Limited reflection
- Oversimplification, and context bound
- Decontextualised knowledge
### A Comparison

<table>
<thead>
<tr>
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<th>Constructivist</th>
<th>Traditional</th>
</tr>
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<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td>Constructed, emergent, situated in action or experience, distributed</td>
<td>Transmitted, external to knower, objective, stable, fixed, decontextualized</td>
</tr>
<tr>
<td><strong>Reality</strong></td>
<td>Product of mind</td>
<td>External to the knower</td>
</tr>
<tr>
<td><strong>Meaning</strong></td>
<td>Reflects perceptions and understanding of experiences</td>
<td>Reflects external world</td>
</tr>
<tr>
<td><strong>Symbols</strong></td>
<td>Tools for constructing reality</td>
<td>Represents world</td>
</tr>
</tbody>
</table>

### A Comparison (Cont.)

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<tr>
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</thead>
<tbody>
<tr>
<td><strong>Learning</strong></td>
<td>Knowledge construction interpreting world, constructing meaning, ill structured, authentic experiential, articulation reflection, process-oriented</td>
<td>Knowledge transmission, reflecting what teacher knows, well-structured, abstract-symbolic, encoding retention retrieval, product oriented</td>
</tr>
<tr>
<td><strong>Instruction</strong></td>
<td>Reflecting multiple perspectives, increasing complexity, diversity, bottomup, inductive, apprenticeship, modeling, coaching, exploration, learner-generated</td>
<td>Simplify knowledge, abstract rules, basics first, application of symbols (rules, principles), lecturing, tutoring, instructor derived and controlled, individual, competitive</td>
</tr>
</tbody>
</table>
Instructional Design Models

- ADDIE: A generic ID model
  - A - Analysis
  - D - Design
  - D - Develop
  - I - Implement
  - E - Evaluate

Instructional Design Models

- Branson's Intra-Services Model
  - Analyse Job
  - Develop Objectives
  - Specify Learning Events/Activities
  - Implement Instructional Management Plan
  - Conduct Internal Evaluation
Instructional Development Institute Design Model

DEFINE
- Identify Problem
- Analyze Setting
- Organize Management

DEVELOP
- Identify Objectives
- Select Methods
- Construct Prototypes

EVALUATE
- Test Prototypes
- Analyze Results
- Implement/Recycle

Dick and Carey

Instructional Analysis
- Goals
- Performance Objectives
- Learner & Context

Revise
- Assessment Instruments
- Instructional Strategies
- Instructional Materials
- Formative Evaluation

Summative Evaluation
Do we need different Design Models for different content?

- Complex knowledge and processes (Constructivist)
- Fixed and basic “content” (Instructivist)
- Jonassen (1991) recommended the most effective application of constructivist learning environments is to the stage of advanced knowledge acquisition, where learners already have well formed schema and knowledge integration. (since recanted)

Toward an Learning Environment Design model

In a constructivist learning environment meaningful learning is emphasised and learners are:

- Active (Manipulative/Observant)
- Constructive (Articulative/Reflective)
- Intentional (Reflective/Regulatory)
- Authentic (Complex/Contextual)

(Jonassen, 1999)
Wedman and Tessmer

Simple ID Process

Limited Time/Resources

Layers of Necessity Model

Complex ID Process

Ample Time/Resources

Quality

Leshin, Pollack, & Reigeluth

1. Analyze Problem
2. Analyze Domain
3. Analyze & Sequence Tasks
4. Analyze & Sequence Content
5. Specify Learning Events & Activities
6. Interactive Message Design
7. Evaluate Instruction
Modern design guidelines

- All knowledge is constructed
- Many worldviews can be constructed: multiple perspectives
- Knowledge is context dependent
- Learning is mediated by tools and signs
- Learning is a social-dialogical activity
- Learners are distributed, multi-dimensional participants in a socio-cultural process
- Knowing how we know is the ultimate human accomplishment

Duffy and Cunningham (1996)

Rethinking learning outcomes

- Declarative Knowledge (knowing that…)
- Structural Knowledge (information networks)
- Cognitive Components (apply rules/principles)
- Situated Problem Solving (“multiple” solutions)
- Knowledge Complexes (mental models)
- Ampliative Skills (information extension)
- Self-knowledge (awareness of learning strategies)
- Executive Control (control internal learning)
- Motivation (conation—ability to self-motivate)
- Attitude (making choices based on values)

(Jonassen & Tessmer, 1996-7)
Changing Design Processes

• Rapid prototyping
  - Generating a concept early
• Concurrent design
  - Implementing as you go!
• Performance Support Systems
  - Just in time support!
• Iterative models
  - Focus on interactivity and interface

Evaluative Prototyping ...

User/Designer

Presentation & Interface Design

Complete Design Brief View

Screens—nodes and links

Interaction Design

Initial Design Brief View

Visual representations of project space

Project Space Information

All information needs and requirements View

Needs Learners Tasks

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The Project space

- the learning outcomes,
- the information which is to be included in the materials,
- how it is structured,
- what the target audience understands about the information
- how it might be structured for the audience

Interaction Design

- link the elements through an instructional or presentation strategy
- identify metaphors that help both the design team and the presentation of the information structure
- describe the underlying knowledge structures and the ways they are linked conceptually and intuitively
Presentation Design

- links the design ideas into a potential presentation structure
- interactive mock-up of the interactive materials
- uses a prototyping tool to show static and dynamic display of information and visual metaphors
- shows user multiple paths to the same or different end-points
- navigation shows what learning possibilities might be available

Developing Technology–Supported Constructivist Environments

- Teacher and learner can communicate in a multitude of ways
- Time and feedback quality of those communications determine the success of the relationship and the learning outcomes.
- How can we best support knowledge construction?
- Learner extracts from a program what sense they make of it, not what use the designer intended
Exploring the Nardoo

- rich embedded information landscape based on a geographic metaphor
- learner-driven investigations using embedded data
- templates supporting manipulation of ideas
- simulating hypothesized relationships
aspire - an exercise in reusing models

Contact

John Hedberg, PhD
Faculty of Education
University of Wollongong
Wollongong, NSW 2522,
Australia.

Email: John_Hedberg@uow.edu.au.
URL: http://www.immll.uow.edu.au/
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DAY THREE

10 September 1999