It’s a Matter of Principles

Designing for Next Generation Learning

Curtiss Barnes, Pearson

Robert Atkinson, PhD, Arizona State University

David Porcaro, PhD, Pearson

Angie McAllister, PhD, Pearson
Who we are

David Porcaro, Ph.D.
Director of Learning Capabilities Design
Pearson
david.porcaro@pearson.com

Curtiss Barnes
Managing Director of Global Product Management and Design, Pearson
Pearson
curtiss.barnes@pearson.com

Robert Atkinson, Ph.D.
Associate Professor School of Computing, Informatics, and Decision Systems Engineering
Arizona State University
robert.atkinson@asu.edu

Angie McAllister, Ph.D.
Senior Vice President Personalized Learning & Analytics
Pearson
angie.mcallister@pearson.com
Quick Review: Learning Design

**Design**
Purpose, planning, or intention that exists behind an object.

**UX Design**
The process of enhancing user satisfaction by improving the usability, accessibility, and pleasure provided in the interaction between the user and the product.

**Learning Design**
The application of research from the learning sciences to UX design to inform and drive outcomes.
Biggest Issue in Education Technology

Academic Research and Design

Education Technology
Design Research at the Intersection

- Design-based Research
- UX Research
- Market Research
- Need
- Theory
- Impact
- Sustainability
- Basic Research
- Evaluation

It's a Matter of Principles | 5

Pearson
## Stages of Research

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundational</td>
<td>Generative</td>
<td>Formative</td>
<td>In Vivo</td>
<td>Summative</td>
</tr>
<tr>
<td>- Problem Identification</td>
<td>- Participatory Research</td>
<td>- Neuroscientific Engagement</td>
<td>- A/B Testing (Design Optimization)</td>
<td>- Efficacy Studies</td>
</tr>
<tr>
<td>- Ethnography</td>
<td>- Rapid Prototype Testing</td>
<td>- Iterative Usability Testing</td>
<td>- Classroom Pilots</td>
<td>- Product Analytics</td>
</tr>
<tr>
<td>- Learner Personas</td>
<td>- Mental Modeling</td>
<td>- Accessibility Testing</td>
<td>- Implementation Studies</td>
<td>- Net Promoter Score</td>
</tr>
<tr>
<td>- Learner Outcomes</td>
<td>- Journey Mapping</td>
<td></td>
<td>- Site Analytics</td>
<td>- Implementation Case Studies</td>
</tr>
<tr>
<td>Learning Principles</td>
<td>- Value Proposition Testing</td>
<td></td>
<td></td>
<td>- Summative Usability Testing</td>
</tr>
<tr>
<td>- Research Synthesis/ Meta-analysis</td>
<td></td>
<td></td>
<td></td>
<td>- Third Party Evaluation</td>
</tr>
</tbody>
</table>
Developing Principles

The **Learning Design Principles** are research-based syntheses of targeted topics within the learning sciences that provide design points of view around what will likely impact learning.

- Address issues emerging from design
- Claim a stance
- Provide shared language
- Describe what works (or doesn’t)
- Show examples of application (and why)
- Provide landmark to compare against
- Build fluency of learning sciences
- Focus on first principles, not trends
# Learning Design Principles

<table>
<thead>
<tr>
<th>Foundations</th>
<th>The Nature of Knowledge</th>
<th>Practices that foster effective learning</th>
<th>Learning Together</th>
<th>Learning Environments</th>
<th>Moving Learning Sciences Research into the Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Design and Instructional Alignment</td>
<td>Data Visualization</td>
<td>Digital design to reduce extraneous cognitive load</td>
<td>Collaborative Learning</td>
<td>Foundations of Adaptive Learning</td>
<td>Global Design</td>
</tr>
<tr>
<td>The Assessment Process: Assessment Instrument Design</td>
<td>Competency-based Learning Models</td>
<td>Digital design to manage intrinsic cognitive load</td>
<td>Peer Tutoring</td>
<td>Motivation Design</td>
<td>Pedagogical Implementation Model Design</td>
</tr>
<tr>
<td>Learning Object Design</td>
<td>Critical Thinking</td>
<td>Readability</td>
<td>Student-Centered Learning</td>
<td>Mobile Learning: Learner Affordances</td>
<td>21st Century Skills</td>
</tr>
<tr>
<td>The Assessment Process: Formative Assessment and the Importance of Feedback</td>
<td>Sequencing and the Repetition of Content</td>
<td>Universal Design for Learning</td>
<td>Argumentation</td>
<td>Mobile Learning: Device and Collaboration</td>
<td>Learning Strategies</td>
</tr>
<tr>
<td>Learner Attributes</td>
<td>Self-Regulated Learning</td>
<td>Grit</td>
<td>Pedagogical Agents</td>
<td>Authentic Learning</td>
<td></td>
</tr>
<tr>
<td>Supporting Student Learning with Feedback</td>
<td>Video in Instruction and Assessment</td>
<td>Goal Setting in Student Progress</td>
<td>Simulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scaffolding</td>
<td>Memory and Learning</td>
<td>Worked Examples</td>
<td>Games and Virtual Worlds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metacognition</td>
<td>Learning Transfer</td>
<td>Problem-based Learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Creative Thinking</td>
<td>Inquiry-based Learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Online Literacy</td>
<td>Mastery Learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Writing to Learn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Applying the Principles

Products “Based on Research”

1. Invisible Interface
2. Consistent
3. JIT Embedded Help
4. Deep Personalization
5. Omnichannel
6. Accessible
7. Objective-based
8. Social & Interactive
9. Supports Motivation & Self Regulation
10. Context Sensitive
Principles as Reference Point
Principle/Research Sync

“Research-based” Products
Generative Research and Principles

- Co-design Workshops
- Learning Principle Card Sort
Learning Across Multiple Studies

What Students are Telling Us:

Motivation:
Aligning content and learning activities to employability and learner skill development by supporting critical thinking and creative problem solving while understanding of “how to” accomplish tasks increases learner motivation to get started and persist even when learning is difficult.

Feedback:
Providing more than correct/incorrect with reasoning feedback types by pointing out learner misconceptions and linking them back to learning resources for just-in-time error correction increases relevance and efficiency for learners.

What We’re Observing:

SRL / Learning Strategies:
Delivering metacognition/SRL faded scaffolding and help tools focuses learner attention and increases confidence and encourages all learners to take greater responsibility for their learning process.

Deliberate Practice:
Creating opportunities for learners’ real-world goal setting, the ability to envision success and understand how to synthesize knowledge into skills increases learner attention and satisfaction by driving quality deliberate practice versus measuring time spent or number of problems completed.
What is Pearson Writer
Applying the Principles: Codesign with Pearson Writer

Supporting Principles:
Self-Regulated Learning
Scaffolding
Writing to Learn
Cognitive Load & Multimedia Learning
Online Information Literacy
Applying the Principles: Intelligent Tutor

Supporting Principles:
Supporting Student Learning w/ Feedback
Scaffolding
Self-Regulated Learning

Pedagogical Agents
Foundations of Adaptive Learning

Retrieval Processes in Memory

Hi Sally, I can help you understand Retrieval Processes in Memory. Would you like to have a conversation about some of the concepts related to this quiz?

Yes.

Great! Let’s cover the information-processing model of memory. Can you explain to me what you know about this concept?

It explains processing of information.

Ok, that’s a start… Do you know all the stages of the information processing model of memory?
Formative Research to Validate Principles

Student wearing neurological headset

Eye-tracking and EEG showing levels of engagement

Multimodal emotion recognition system

- Sensing Devices
- Perception mechanisms
  - Brainwaves
  - Eye movements
  - Facial expressions
  - Physiological signals

User

Raw data

Beliefs
Measuring Learning Impacts

**Main Effects Plot for Posttest Grade**

**Main Effects Plot for Engagement**

### Description
- Overview
- Introduction
- Presentation (Core Content)
- Check Your Understanding
- Review
- Lesson Summary

**Engagement for Web by segment**
# Efficacy: The Ultimate Test

<table>
<thead>
<tr>
<th>Idea</th>
<th>Explore</th>
<th>Validate</th>
<th>Grow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundational</td>
<td>Generative</td>
<td>Formative</td>
<td>In Vivo</td>
</tr>
</tbody>
</table>

- **Evaluation 1** (User Study)
- **Eval 2** (Lab Study)
- **Eval 3** (A/B test)
- **Eval 4** (Efficacy Study)

**Discovery**
You Try: Using the Principles

Objective Design and Instructional Alignment

**Description**
Instructalional alignment is an essential component of any effective learning experience. The presence of instructional alignment positively impacts learning. Instructional alignment is a significant and necessary prerequisite condition for both the delivery of effective and the application of various content-based instructional design models. The design of instructional alignment begins with the instructional design, which in turn influences the design of the instructional strategies and the selection of the instructional strategies.

**LEARNER IMPACTS**
- Achievement
- Safety
- Regulation

**CAPABILITIES**
- Adaptive learner navigation
- Instructional multimedia delivery
- Management learner feedback

**SAMPLE DESIGN IMPLEMENTATIONS**
- Adaptive Technology: Adaptive practice aligned to objectives
- Simple Technology: Objectives in learning content design
- Content Support: Shaping learner performance by objective

---

**Principle Lenses**

<table>
<thead>
<tr>
<th>Principle Lenses</th>
<th>Integration in Practice</th>
<th>Application to every learner</th>
<th>Consideration for every learner</th>
<th>Not Applicable to every learner</th>
<th>True/False</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
<td>Strong use of learning outcomes within instructional design.</td>
<td>Some use of learning outcomes within instructional design.</td>
<td>Some use of learning outcomes within instructional design.</td>
<td>Use of learning outcomes within instructional design.</td>
<td>True/False</td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td>Even use of objectives. All learning outcomes.</td>
<td>Weak use of objectives. Some learning outcomes.</td>
<td>Weak use of objectives. Some learning outcomes.</td>
<td>Use of objectives. All learning outcomes.</td>
<td>True/False</td>
</tr>
<tr>
<td><strong>Alignment</strong></td>
<td>Strong use of instructional alignment guidelines to facilitate learning.</td>
<td>Weak use of instructional alignment guidelines to facilitate learning.</td>
<td>Weak use of instructional alignment guidelines to facilitate learning.</td>
<td>Use of instructional alignment guidelines to facilitate learning.</td>
<td>True/False</td>
</tr>
</tbody>
</table>

---

**Using Learning Design to Build More Effective, Engaging Products**

Pearson
Suggested Further Readings
There’s so much more to learn

Find out more about us at

www.pearson.com
ALWAYS LEARNING