Foundations of Adaptive Learning  
(Personalized Learning)

Research into adaptive learning has shown positive impact on learning, especially within micro-adaptive systems which have been demonstrated to be almost as effective as a human tutor (VanLehn, 2011). Adaptive learning technologies provide an environment that can intelligently adjust to individual learner needs by presenting appropriate information, instructional materials, scaffolds, feedback, and recommendations based on learner characteristics and particular situation.

Adaptive learning is broken up into five different categories:

1. Analytics: The base functionality that supports other forms of adaptive learning but may also be used to display important information to learners and instructors so they may adapt their own learning (Baker & Siemens, 2014).
2. Local: Targeted feedback, hints, and remedial content (Durlach & Ray, 2011).
3. Dispositional: Adaptation based on individual student variables such as aptitudes (Pashler, McDaniel, Rohrer, & Bjork, 2008).

Such categories may be combined to provide greater levels of adaptive learning to support individual learners.

LEARNER IMPACTS

• Self-regulation  
• Achievement  
• Motivation

CAPABILITIES

• Adativity: Adaptive spacing  
• Adativity: Adaptive study plan  
• Adativity: Mastery and confidence based adaptivity

SAMPLE DESIGN IMPLEMENTATIONS

• Robust Technology: Personalized learning environment  
• Simple Technology: Targeted study aids  
• Content Support: Extensive content flexibility
<table>
<thead>
<tr>
<th>Principle Criteria</th>
<th>Integration (4-5 points)</th>
<th>Exploration (2-3 points)</th>
<th>Consideration (1 point)</th>
<th>Not Applicable (0 Points)</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Strong consideration for diversity in learners, methods, modes, media, and other factors</td>
<td>Some consideration for diversity in learners, methods, modes, media, and other factors</td>
<td>Poor consideration for diversity in learners, methods, modes, media, and other factors</td>
<td>Does NOT use effectively or is not a related activity</td>
<td>= ____</td>
</tr>
<tr>
<td>Model</td>
<td>Strong alignment between learning objectives and potential types of adaptivity, such as content agnostic, content level, and intelligent</td>
<td>Some alignment between learning objectives and potential types of adaptivity, such as content agnostic, content level, and intelligent</td>
<td>Poor alignment between learning objectives and potential types of adaptivity, such as content agnostic, content level, and intelligent</td>
<td>Does NOT use effectively or is not a related activity</td>
<td>= ____</td>
</tr>
<tr>
<td>Design</td>
<td>Strong application of key adaptive learning principles: • Misconception identification • Masterly learning • Varied feedback • Spaced practice • Self-regulated learning (SRL) • Shared control • Affective elements • Application variety • Segmented content • Signaling</td>
<td>Some application of key adaptive learning principles: • Misconception identification • Masterly learning • Varied feedback • Spaced practice • SRL • Shared control • Affective elements • Application variety • Segmented content • Signaling</td>
<td>Poor application of key adaptive learning principles: • Misconception identification • Masterly learning • Varied feedback • Spaced practice • SRL • Shared control • Affective elements • Application variety • Segmented content • Signaling</td>
<td>Does NOT use effectively or is not a related activity</td>
<td>= ____</td>
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<tr>
<td>Assessment</td>
<td>Strong use of timely and relevant feedback to facilitate learner improvement</td>
<td>Some use of timely and relevant feedback to facilitate learner improvement</td>
<td>Poor use of timely and relevant feedback to facilitate learner improvement</td>
<td>Does NOT use effectively or is not a related activity</td>
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