1 First principles of instruction

David Merrill synthesized the key principles common among leading instructional-design frameworks to produce his first principles of instruction [3]. Namely, learning is promoted when

1. ...learners solve problems that integrate multiple ideas and skills (task-centered principle [4, 5]).

2. ...existing knowledge is activated as a foundation for new knowledge (activation principle).

3. ...new knowledge is demonstrated to the learner (demonstration principle).

4. ...new knowledge is applied by the learner, with feedback (application principle).

5. ...new knowledge is integrated into the learner’s world (integration principle), providing a base for the next learning cycle of activation, demonstration, ...
3 ICAP framework: A different category of framework

The preceding frameworks are particularly useful for designing the longer-time-scale portions of a course (or curriculum). Chi’s ICAP framework [1] is particularly useful for designing problems and class activities. It refines the distinction between active and passive (P) learning by subdividing active into three levels—active (A), constructive (C), and interactive (I)—each promoting deeper learning than the preceding level.

<table>
<thead>
<tr>
<th>Cognitive engagement</th>
<th>Characteristics</th>
<th>Depth of learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactive</td>
<td>dialogue with tutor or another student (e.g., debating conceptual question)</td>
<td>understanding that might create new ideas</td>
</tr>
<tr>
<td>Constructive</td>
<td>adding to the information (e.g., drawing a diagram or concept map, self-explaining)</td>
<td>deeper understanding that might transfer</td>
</tr>
<tr>
<td>Active</td>
<td>doing something with hands or bodies with the material, but not adding to the information (e.g., highlighting)</td>
<td>shallow understanding</td>
</tr>
<tr>
<td>Passive</td>
<td>simply paying attention (e.g., watching lecture or video)</td>
<td>minimal understanding</td>
</tr>
</tbody>
</table>

References and further reading


