Integrating Technology and Teaching

Ruben R. Puente, Ph.D.
Substitution

Tech acts as a direct tool substitute, with no functional change

Augmentation

Tech acts as a direct tool substitute, with functional improvement

Modification

Tech allows for significant task redesign

Redefinition

Tech allows for the creation of new tasks, previously inconceivable

Enhancement

Transformation

Ruben R. Puentedura, As We May Teach: Educational Technology, From Theory Into Practice, (2009)
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<table>
<thead>
<tr>
<th>Social</th>
<th>Mobility</th>
<th>Visualization</th>
<th>Storytelling</th>
<th>Gaming</th>
</tr>
</thead>
<tbody>
<tr>
<td>200,000 years</td>
<td>70,000 years</td>
<td>40,000 years</td>
<td>17,000 years</td>
<td>8,000 years</td>
</tr>
</tbody>
</table>

Fig. 2. Estimates by 160 gynecologists of the probability that a woman has breast cancer given a positive mammogram, before and after receiving training in how to translate conditional probabilities into natural frequencies.
Brief Lecture or Group Discussion
(~10 minutes)

ConcepTest
(~1-2 minutes)

Fewer than 30% of students answer correctly
- The instructor revisits and explains the concept

Between 30-75% of students answer correctly
- Peer Discussion: students try to convince each other (~2-3 minutes)

More than 75% of students answer correctly
- The instructor explains remaining misconceptions

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Understanding Science: How Science Works

EXPLORATION AND DISCOVERY

TESTING IDEAS

BENEFITS AND OUTCOMES

COMMUNITY ANALYSIS AND FEEDBACK
Supportive, contradictory, surprising or inconclusive data may...

EXPLORATION AND DISCOVERY

Making observations
Adding questions
Sharing data and ideas
Finding inspiration
Exploring the literature

Satisfy curiosity
Solve everyday problems
Build knowledge
Inform policy
Address societal issues
Develop technology
Gather data
Interpret data
Testing ideas

Feedback and peer review
Replication
Theory building
Discussion with colleagues
Publication
Coming up with new questions/ideas

Gathering data
Interpreting data

New technology
Practical problem
Curiosity
Serendipity
Surprising observation

Testing ideas

Benefits and outcomes

Discussion with colleagues
Feedback and peer review
Replication
Survey building
Publication
Sharing data and ideas

Community analysis and feedback

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Scholarly Primitives

- Discovering
  - searching, browsing, accessing, collecting

- Annotating
  - categorizing, providing commentary, analyzing
  - find differences, similarities and create meaning from them

- Comparing

- Referring
  - linking, referencing

- Sampling
  - selecting according to a criterion, showing relationships of items selected to the original set

- Illustrating
  - showing an example, highlighting features within an example

- Representing
  - changing depiction mode, publishing

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