Using – Analysing – Creating – Embedding


Lutz Hellmig & Tino Hempel

University of Rostock
Secondary Grammar School “Richard Wossidlo” Ribnitz-Damgarten

The implementation of the topics typically follows three steps

- Using
- Analysing
- Creating

⇒ What does that mean?

$^1$in fact: Breier (2002)
Theoretical Context

- Nine steps of Instructional Design (Gagné)
  - 1965 4. Presenting the content
  - 1974 4. Presenting stimulus material
- Discovery Learning
- Scaffolding (Vygotsky, Bruner)
Looks familiar, but...²

²Lee et al. 2011

Using – Analysing – Creating – Embedding

Hellmig/Hempel
Using is motivation.

Never without a context...

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>shows</td>
<td>admission fee</td>
<td>public rehearsal</td>
<td>premiere</td>
<td>2nd show</td>
<td>3rd show</td>
<td>4th show</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>£2,00</td>
<td>£5,00</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>spectators</td>
<td>teachers</td>
<td>7</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>spectators</td>
<td>students</td>
<td>8</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>earnings</td>
<td>30</td>
<td>200</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using – Analysing – Creating – Embedding

Hellmig/Hempel
Using is motivation.

Using
- Use digital systems or haptic manipulatives
- Gather experience
- Identify limitations and errors
Using – What do the students get?

- Suitable contexts
- Opportunities for operating enactively (if possible)
- Unfinished or ill-structured, but modifiable digital systems
- Tasks leading to embedded problems
2 Encourage students to analyse.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>shows</td>
<td>public rehearsal</td>
<td>premiere</td>
<td>2nd show</td>
<td>3rd show</td>
<td>4th show</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>admission fee</td>
<td>£4.00</td>
<td>£10.00</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>spectators</td>
<td>teachers</td>
<td>7</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>spectators</td>
<td>students</td>
<td>8</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>earnings</td>
<td>=C2*(C3+C4)</td>
<td>200</td>
<td>=E2*(E3+E4)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using – Analysing – Creating – Embedding

Hellmig/Hempel
Analysing is constructing knowledge.

**Using**

- Use digital systems or haptic manipulatives
- Gather experience
- Identify limitations and errors

**Analysing**

- Make assumptions
- Examine digital systems
- Get insights
What does students encourage to analyse?

- Support and slight impulses
- Opportunities to compare
- Responding digital systems
### 3 From analysing to creating purposefully.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>shows</td>
<td>public rehearsal</td>
<td>premiere</td>
<td>2nd show</td>
<td>3rd show</td>
<td>4th show</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>admission fee</td>
<td>£4.00</td>
<td>£10.00</td>
<td>£4.00</td>
<td>£4.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>spectators</td>
<td>teachers</td>
<td>7</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>spectators</td>
<td>students</td>
<td>8</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>earnings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using – Analysing – Creating – Embedding

Hellmig/Hempel
Creating is the first utilisation.

**Using**
- Use digital systems or haptic manipulatives
- Gather experience
- Identify limitations and errors

**Analysing**
- Make assumptions
- Examine digital systems
- Get insights

**Creating**
- Correct errors
- Enhance digital systems
- Transfer knowledge to different contexts
What makes students create?

- Imperfection of the material given
- Open-ended tasks for further development
### Embedding

**Researching-Developing Education**

<table>
<thead>
<tr>
<th>Identifying the problem</th>
<th>Reason for problem</th>
<th>Using</th>
<th>U-A-C-E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Finding the problem</td>
<td>Using/Analysing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Posing the problem</td>
<td>Analysing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thoughts on problem solving</th>
<th>Analysing the problem</th>
<th>Analysing</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Suggestions for solving the problem</td>
<td>Creating</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decisions for solving the problem</td>
<td>Creating</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Realisation of the solution</th>
<th>Planning specific steps</th>
<th>Creating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Executing the plan for the solution</td>
<td>Creating</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reflecting on and summarising the result</td>
<td>Creating</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Abstraction of the results</th>
<th>Iconic abstraction</th>
<th>Embedding</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Verbal abstraction</td>
<td>Embedding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Symbolic abstraction</td>
<td>Embedding</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consolidating knowledge</th>
<th>Examples (Transfer)</th>
<th>Creating/Embedding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Repeating content and methods</td>
<td>Embedding</td>
</tr>
<tr>
<td></td>
<td>Examining achievement of learning objectives</td>
<td>Embedding</td>
</tr>
</tbody>
</table>

---

Schmidkunz/Lindemann (1976)
What is missing?

Using
Analysing
Creating
Embedded

- Conclusions
- Making aware learning efforts
- Bridging the gap – linking new insights to previous knowledge
4 Embedding

Cognitive Operations

- Verbalise or transfer to a different mode of representation
- Systemise
- Transfer to related problems

Methods

- ... current field of research
Using – Analysing – Creating – Embedding

Advantages

- Practical, discovering approach
- Focus on student-centered activity
- Meeting individual needs of the students

Agenda

- Student-centered methods for embedding
- Field studies
- Application to different contents and objectives
Discussion

Thank you.

Any questions?