Application of remote experiments in a secondary school using MOOC approach

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10 contemporary pedagogy:

1. learning in informal settings
2. learning through argumentation
3. incidental learning (smartphones, games, fictions movie)
4. context-based learning from their experience
5. computational thinking /problem solving
6. **learning by doing science with remote labs**
7. embodied learning involves the interaction of the body with a real or simulated world
8. **adaptive teaching by an adapted content for each student**
9. analytics of emotions
10. assessment measure and support the 21st-century competencies (automatic data collection with reach digital environments, e.g., online game-playing)
ODL project

Main task:

• to introduce the use of MOOCs in school curricula
• in conjunction with the STEM laboratories (online and hands-on).
MOOC 4D model

Nish Sonwalkar (2013)

LEARNING OBJECTS:
- Simulation
- Animation
- Video
- Audio
- Graphics
- Texts

INTERACTIVITY:
- Intelligent Feedback
- Simulations
- Animation
- Games

LEARNING MODELS (L1-L5):
- Apprenticeship (teacher–student interaction)
- Incidental (using case study)
- Inductive (using example)
- Deductive (application usage)
- Discovery (learning through experimentation)

SOCIAL CONSTRUCTION (discussion, wiki, facebook)
ODL: micro-MOOC

Content-load, time consuming and classroom activity

microMOOC +
micro-MOOC: structure

• Intro (text or short video) – info about the topic of the study, or discussion topic, what will be assignment
• Lectures (usually, set of videos)
• Readings (suggested literature, wikipedia, pages from study book, provided copies from other books)
• Assignment (could be video/audio instruction): work on the forum
micro-MOOC: structure

• Evaluation:
  – Self-evaluation
  – Peer-evaluation
  – Teacher evaluation
  – Learning Analytics

• Usually self- and peer- evaluation uses
edX as a platform for micro-MOOC

- Open edX Studio (Authoring tool)
- The Open edX LMS (Learning Management System)
- Several Blocks – implements assessment problem type in a platform
- Discussion forum
ODL MOOC Platform - LMS: Student’s dashboard

MY COURSES

Electricidad y electromagnetismo
UD - Tecnologia_1314
Started - Jan 18, 2017
View Course

Ανιχνεύοντας Βαρυτικά Κύματα
Ellinogermaniki_Agogi - EA102
Starts - Mar 01, 2017
View Course

“Stop Noise Pollution”
ODL_FD - Physics_12-15
View Course

International Conference exp.at 2017  Faro, Portugal
Inquiry method

- ENGAGE
- EXPLORE
- EXPLAIN
- EXTEND
- EVALUATE

Rodger W. Bybee

International Conference exp.at 2017  Faro, Portugal
<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
<th>Time</th>
<th>Total time (min-max)</th>
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<tbody>
<tr>
<td>1</td>
<td>Topic Introduction</td>
<td>1-3 min</td>
<td>1-3</td>
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<tr>
<td>2</td>
<td>Student Engagement and Motivation</td>
<td>4-6 min</td>
<td>5-9</td>
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<td>3</td>
<td>Initial Exploration of the virtual/remote Lab</td>
<td>3-6 min</td>
<td>8-15</td>
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<td>4</td>
<td>Questioning - Stimulating curiosity</td>
<td>2-4 min</td>
<td>10-19</td>
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<td>5</td>
<td>Performing virtual experiments I</td>
<td>2-5 min</td>
<td>12-24</td>
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<tr>
<td>6</td>
<td>Questioning - Stimulating reasoning</td>
<td>2-4 min</td>
<td>14-28</td>
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<tr>
<td>7</td>
<td>Performing virtual experiments II</td>
<td>2-5 min</td>
<td>16-33</td>
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<tr>
<td>8</td>
<td>Questioning – Providing reasonable explanations</td>
<td>2-4 min</td>
<td>18-37</td>
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<tr>
<td>9</td>
<td>Performing virtual experiments III</td>
<td>2-5 min</td>
<td>20-42</td>
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<tr>
<td>10</td>
<td>Questioning – Providing concluding remarks</td>
<td>2-5 min</td>
<td>22-47</td>
</tr>
</tbody>
</table>
Resistors in series connections
micro-MOOC: basic requirements

• affective engagement of the students;
• harmonize learning process for students with different knowledge and interest;
• generating curiosity and leading to questions;
• a cognitive conflict;
• scientific investigation and explanation within the competence of the students involved;
• creating scientific knowledge;
• requiring the students to use inquiry skills to explain the involved phenomena;
• limiting time of use (1–2 lessons for the presentation and applying of remote/virtual labs)
Future action

Creating the library of the microMOOCs and implementation in a class in the EU countries
THANK YOU!