Combining Pedagogy and Technology to Enhance the MOOC Learner Experience

Prof. Dov Dori
edX Professional Certificate Program – the new homepage
https://www.edx.org/professional-certificate/israelx-model-based-systems-engineering

Develop systems thinking

Israel X

Professional Certificate in
Model-Based Systems Engineering - MBSE
Courses in this program

IsraelX and Technion's Model-Based Systems Engineering - MBSE Professional Certificate

- Model-based Systems Engineering: Foundations
- Model-based Systems Engineering: Advanced Approaches with OPM
- Job Outlook
Professional Certificate in Model-Based Systems Engineering - MBSE
IsraelX and Technion

What you will learn

• **Identifying** objects and their transformation by processes
• **Modeling** the system’s top-level diagram
• **Modeling** various kinds of systems:
  - technological
  - natural
  - complex socio-technical systems
• **Managing** system complexity
The student is immersed in the story of job hunting and starting
EdX MOOC - Pedagogical Principles

Learner Engaging
Learning Styles Diversity

Videos, text & graphics, six types of questions – non-visual & visual
Learner Engaging

Learning Styles Diversity

Content Authenticity

Modeling authentic technological, natural, and socio-technical systems
No gender preference: the learner can see herself or himself in the story
Course content & structure

1. edX Professional Certificate Program
2. five-week courses: MBSE101 + MBSE102
10. sections, 5 in each course
~ 25. subsections
~ 110. units
~ 60. 4-7 min. video clips
~ 240. questions
X 3. languages (English; Hebrew & Arabic in progress)
Grading Policy – edX learners

- **Unit test** – 15% (~80q per course)
- **Section test** – 35% (~30q per course)
- **Final test** – 50% (~10q per course)

First Cohort (Spring 2019): **400 students worldwide**

Current Cohort (Fall 2019): **1300 students worldwide**
Grading Policy – Technion students

- Basic & Advanced MOOC courses – 40%
- Software modeling project – 60%
  Technion students only

First Cohort (Spring 2019): 400 students worldwide
60 of them were Technion students in course 094222

Current Cohort (Fall 2019): 1300 students worldwide
150 of them were Technion students in course 094222
Cutting-Edge Cloud Educational Technology
OP Cloud - Implements OPM ISO 19450

https://www.opcloud.tech/

Continuously being developed at the Technion’s Enterprise Systems Modeling Laboratory (ESML)

http://esml.iem.technion.ac.il/
MOdeling with Real-Time Informative Feedback – MORTIF

**Question example**

What the student gets:

The object [Car Chassis](#) appears on your OPCloud canvas below.

1. Add a new object to the canvas, [Charging Module Pile](#).
2. Express the fact that [Charging Module Pile](#) is part of [Car Chassis](#).
3. Submit your solution to check its correctness.

*You can use the hints below the canvas*
Question example – What the student gets:

The object **Car Chassis** appears on your OPCloud canvas below.

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Question types & their distribution

Visuality & hands-on

- Checkbox: 40%
- Multiple choice: 20%
- Dropdown: 15%
- Drag and drop: 10%
- Image map: 5%

MORTIF
MORTIF – Preliminary Research Findings

Purpose – Investigate students’ perceptions on:

- the usability of MORTIF
- the contribution of MORTIF to learning
MORTIF-type assignments:

Students’ resubmission & self-assessment Preferences (N=63; 2583 submissions)

- Final task (n=1008 cases): 42% submitted once, 58% resubmission
- Section task (n=1134 cases): 47% submitted once, 53% resubmission
- Unit task (n=441 cases): 69% submitted once, 31% resubmission

Resubmissions increase as the task complexity level increases ➔ Students use the resubmission option when they need it.

F(2, 110)=158.18, p<.001, η²=.74

Final > Section > Unit
MORTIF-type assignments: Students’ perceived contribution

All MORTIF tasks are perceived as contributing; Section and final tasks are more conducive to learning.

F(2, 74) = 16.84, p < .001, η² = .31

⇒ final & section > unit
MORTIF vs. other assignment types:
Students’ perceived contribution

Non-Visual
- dropdown: 16%
- checkbox: 21%
- multiple choice: 47%

Visual
- drag and drop: 58%
- image map: 68%
- MORTIF: 92%
Summary

Our edX MOOC course implements a variety of
- educational technologies
- pedagogical principles:
  - personalized learning styles
  - active learning – the most effective style

Teaching students 21st century skills:
- systems thinking
- self-assessment
Thanks for listening!

Visit our Lab site: http://esml.iem.technion.ac.il/

Experience OPCloud, Cloud-based OPM modeling: https://www.opcloud.tech/

Contact us:

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Let’s watch the short course trailer
To begin, let us watch a short video.
A student email example

From: Pierre-Marc Guilbault <pierremarc.guilbault@gmail.com>
Sent: Tuesday, November 26, 2019 3:27 PM
To: Niva Wengrowicz; Dov Dori; Hanan Kohan
Subject: Re: MBSE101 edX course - congrats

Folks,

Simply to say thank you for the great course on OPM foundation as I just completed the final exam. I can see the efforts you have put into building this course with the videos, visual, exercises, stories, pace of materials. OPM is a simple, yet powerful language and methodology for modeling.

Looking forward to the advanced course.

Cheers,

Pierre-Marc
# MORTIF-type assignments

## Learning style suitability: Active learning – a clear winner

<table>
<thead>
<tr>
<th>Learning style</th>
<th>Focus on</th>
<th>Student excerpt example</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential vs. Global</td>
<td>information organizing preference</td>
<td>Felt like a continuous problem that added more with each step.</td>
<td>10%</td>
</tr>
<tr>
<td>Sensing vs. Intuitive</td>
<td>information collecting preference</td>
<td>The possibility to submit several times allowed a trial and error process.</td>
<td>11%</td>
</tr>
<tr>
<td>Active vs. Reflective</td>
<td>information processing</td>
<td>Constructing the model really made the learning deeper than all the other problem types.</td>
<td>59%</td>
</tr>
<tr>
<td>Visual vs. Verbal</td>
<td>information presentation preference</td>
<td>I prefer the graphics and visual problems.</td>
<td>13%</td>
</tr>
</tbody>
</table>