HOW TO TEACH HUMANS
(WITH MACHINES)

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I WILL EXPLORE THE QUESTION:

How to develop digital learning devices that enable people to learn better and faster
QUESTIONS

1. How do humans learn?
2. How can you help humans to learn better and faster?
3. What are the implications for the development of digital devices
DIGITAL DEVICES?
DIGITAL DEVICES?
DIGITAL DEVICES?

“INTERNET OF (EDUCATIONAL) THINGS”
Of course!
It is not the hardware as such, but the applications that run on the hardware
A SHORT PERSONAL STORY
WHAT IS LEARNING?

A change in the mental representations of the world
REPRESENTATIONS ARE IN THE BRAIN...
Ohlson (2011):

“Differences in representations explain differences in behavior”

“Cognitive functions (like learning, thinking, acting) are implemented by processes that create, utilize and revise representations”
c’est une pipe
TEST: PICTURE SIMILAR TO REPRESENTATION?
WHERE ARE THE REPRESENTATIONS IN THE COGNITIVE SYSTEM?

The modal model
adapted from
Atkinson & Shiffrin
Representations can change automatic and unconscious!

Visual illusions are a great means to *illustrate* this principle. So I will show you two different ones:
HOW MANY BLOCKS?
SOME REPRESENTATIONS CAN BE HARD TO CHANGE
HOLLOW MASK
WHAT HAPPENS IN THE BRAIN?

“Where”

“What”
THE CHALLENGE OF LEARNING TECHNOLOGIES

Help people to change their mental representations

Learning Better, Learning Faster
THE CONCEPT OF “HUMAN LEARNING INTERFACES” (HLI)

• In Human Computer Interaction the focus on the question “how humans can instruct a machine in order to perform some tasks”
  => User Interface

• In Teaching with technology it is the other way around: “how can machines instruct humans to support learning, i.e. change representations”
  => Human Learning Interface
THE CONCEPT OF “HUMAN LEARNING INTERFACES” (HLI)
THE CONCEPT OF “HUMAN LEARNING INTERFACES” (HLI)

e.g., Apps on Laptops, Smart boards, Robots, HUDs, Mobiles, Wearables, Smart ‘things’

e.g., Teachers, Parents, Peers
INTERVENTIONS

Building blocks of interventions

1. Ask the learner a question
2. Assign a task to the learner
3. Provide something to the learner (information, materials)
4. Conditioning of the environment (eg, incentives)

In order to implement educational software, all of these basic interventions should be available.
5 TYPES OF HUMAN LEARNING INTERFACES EACH WITH THEIR OWN OBJECTIVES

- Re-consider, restructure
  - Reflection
- Improve, automate
  - Practice
- Learning new representations
  - Identification
  - Creation
  - Socialization
IDENTIFICATION

Learning to represent new situations and events in the world and know how to act and react
IDENTIFICATION
IDENTIFICATION: LABELS AND STORIES
IDENTIFICATION
SOCIALIZATION

Learning to represent the behaviors, habits and culture of a social group enabling you ‘to behave’ within these groups
SOCIALIZATION
SOCIALIZATION
Learning to represent new sequences of behavior in order to create something
CREATION
Learning to represent situations & actions faster and better, as measured through some performance criteria
REFLECTION

Learning to create representations of representations and to change the initial representations and behaviors
REFLECTION
How to develop digital learning devices that enable people to learn better and faster
ANSWER: UTILIZE HLIs
CORE FUNCTIONS OF A DIGITAL DEVICE THAT CAN TEACH HUMANS
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CORE FUNCTIONS OF A DIGITAL DEVICE THAT CAN TEACH HUMANS

Digital Learning Device

1. Identification
2. Socialization
3. Creation
4. Practice
5. Reflection

Human-Device Interface

- Objectives
- Observables
- Interventions
- Learner
- Physical environment of the learner

Digital Devices
Humans
CORE FUNCTIONS OF A DIGITAL DEVICE THAT CAN TEACH HUMANS

Set interventions

Set objectives
1. Identification
2. Socialization
3. Creation
4. Practice
5. Reflection

Digital Learning Device

Human Learning Interface
- Objectives
- Interventions
- Observables

Learner
Physical environment of the learner
CORE FUNCTIONS OF A DIGITAL DEVICE THAT CAN TEACH HUMANS

Digital Learning Device

- Set interventions
  - questions
  - tasks
  - resources
  - conditioning

- Set objectives
  - Identification
  - Socialization
  - Creation
  - Practice
  - Reflection

Diagram:
- Human Learning Interface
- Objectives
- Observables
- Interventions
- Learner
- Physical environment of the learner
- Digital Device
- Humans
CORE FUNCTIONS OF A DIGITAL DEVICE THAT CAN TEACH HUMANS

Set interventions
- questions
- tasks
- resources
- conditioning

Set objectives
- Identification
- Socialization
- Creation
- Practice
- Reflection

Digital Learning Device

Sensoring of observables

Diagram showing the interaction between digital devices, humans, and the learning process involving observables and interventions.
CORE FUNCTIONS OF A DIGITAL DEVICE THAT CAN TEACH HUMANS

Digital Learning Device

- Set interventions:
  - questions
  - tasks
  - resources
  - conditioning

- Set objectives:
  - Identification
  - Socialization
  - Creation
  - Practice
  - Reflection

UI other devices/humans

Sensoring of observables
CORE FUNCTIONS OF A DIGITAL DEVICE THAT CAN TEACH HUMANS

Digital Learning Device

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UI other devices/humans

Sensoring of observables
CORE FUNCTIONS OF A DIGITAL DEVICE THAT CAN TEACH HUMANS

Digital Learning Device

Set interventions
- questions
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Set objectives
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- Socialization
- Creation
- Practice
- Reflection

UI other devices/humans

Script

Adapt +/-

Sensoring of observables
### HOW TO TEACH HUMANS TO LEARN BETTER AND FASTER?

<table>
<thead>
<tr>
<th>Action</th>
<th>Types of HLIs</th>
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<tbody>
<tr>
<td>• Utilize natural learning interfaces to change representations</td>
<td>Re-consider, restructure</td>
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<tr>
<td>• Make a clear distinction between learning new physical worlds, new social worlds and learning to create</td>
<td>Reflection</td>
</tr>
<tr>
<td>• Always combine learning of new representations with sufficient practice and reflection</td>
<td>Improve, automate</td>
</tr>
</tbody>
</table>

- Learning new representations
  - Identification
  - Creation
  - Socialization
THANK YOU!

READ MORE?
TINYURL.COM/ROBKOPER