



Mixed Reality Learning and Working Environments (MARVEL project)

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Introduction to MARVEL



- **A European Leonardo da Vinci pilot project**
- **Focused on e-Learning in mechatronics**
- **Project consortium**
 - 3 Technical colleges
 - 3 Enterprises
 - 1 Qualification authority
 - 2 Universities

The idea behind MARVEL



- **To develop and evaluate a training concept that supports a 'mix' of virtual in combination with practical learning**
- **Integration of different...**
 - virtual and real learning media and tools
 - learning places (school, laboratory, work place, home, ...)
 - learning activities based on experiential learning concept



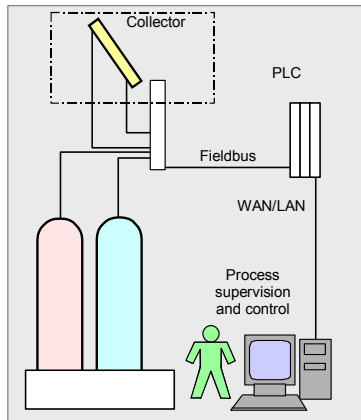
Mixed Reality Learning and Working Environment

MARVEL example learning scenario



Learning task:

Process control and maintenance of a full-scale solar plant



Learning objectives

- Theoretical knowledge and operational skills to control a complex solar system
- Competence to maintain the solar plant with adequate tools and methods
- Ability for service- collaboration between different technicians with cultural and professional backgrounds
- More ...

Overview of different learning arrangements



- Traditional classroom instruction
- Online course
- On-site training
- Remote laboratory / workshop
- Virtual laboratory
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On-site training at the work place



On-site training at the work place

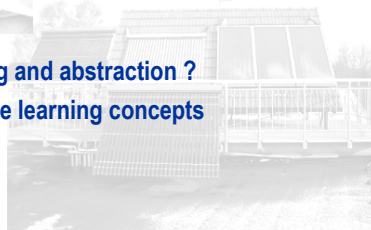


■ Pros

- Real world tasks (community of practice)
- Learning by doing (motivation)
- Haptic experience

■ Cons

- Safety issues
- High costs
- Room for conceptual learning and abstraction ?
- Difficult to provide in distance learning concepts



Remote laboratory / workshop



Intranet
Internet



Remote laboratory/ workshop



■ Pros

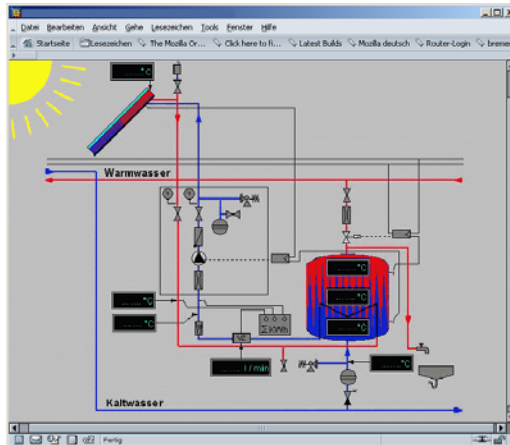
- Learning on demand
- Sharing of resources
- Cooperative learning possible

■ Cons

- Higher costs than simulations
- Safety issues
- Technology



Virtual laboratory (process simulation)



V.1.1

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Virtual laboratory (process simulation)

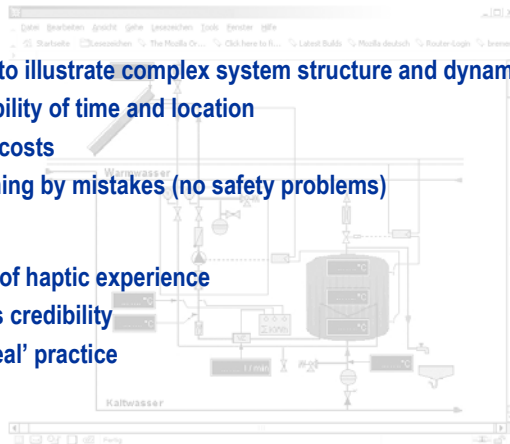


■ Pros

- Ideal to illustrate complex system structure and dynamic behaviour
- Flexibility of time and location
- Less costs
- Learning by mistakes (no safety problems)

■ Cons

- Loss of haptic experience
- Lacks credibility
- No 'real' practice

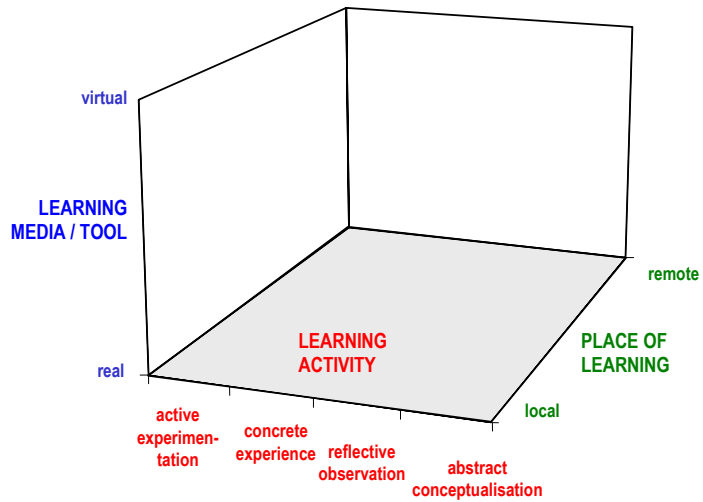


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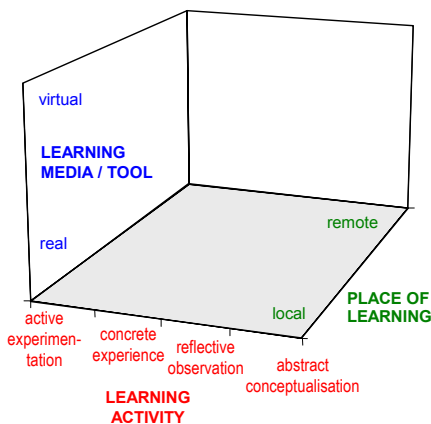
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Mixed Reality Learning Space



Mixed Reality Learning Space

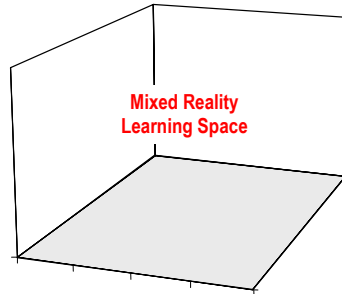


- **Online Course**
 - Virtual, digital, distant, abstract, ...
- **On-site Training**
 - Real Tools, active and concrete
- **Remote Laboratory/workshop**
 - virtual tools (real), remote resources, active experimentation,
- **Virtual Laboratory**
 - Virtual, local or remote
- **Others...**

Conclusion



- There is a role for different learning arrangements in the learning process
- A 'mix' of virtual learning in combination with practical learning brings an added-value that justifies the creation of institutional networks
- The creation of Mixed Reality Learning and Working Environments enhances learning



Thank you for your attention



Virtual Laboratory in Mechatronics :

Access to remote communication

and virtual e-learning coordination

www.marvel.uni-bremen.de cooperation

Leonardo da Vinci Pilot projects

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