Go-Lab: a portal for pedagogically embedded online labs

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We need engaging (science and engineering) instruction
What can we do?

- Constructive (inquiry) learning
- Collaborative learning
- Situated learning
- Computer simulations/games
- Modeling environments
- Shared objects
- Chats, video conferencing
- Simulators, videos

Online laboratories
Are virtual labs/simulations effective?

If well designed, guidance included, inquiry-based learning with online labs and simulations shows an advantage over expository instruction.

Example meta-study

• 59 studies included, 128 effect sizes
• Academic skills outcomes
  – Simulation ≥ No simulation (N = 3947)
  – Simulation plus > Simulation (N = 6842)
  – Moderately high effect sizes

Are virtual labs/simulations effective?

• Students in online labs gain the same level of knowledge or a more advanced level of knowledge than students who learn in a real laboratory

Effectiveness of virtual labs compared to wet labs

• The possibility to perform many more experiments

• The possibility to augment labs

• The possibility to combine labs with online pedagogical support
And how about remote labs?

- The possibility to perform many more experiments
- The possibility to augment labs (example Luis laser)
- The possibility to combine labs with online pedagogical support
Problems in discovery

• Poor hypotheses
• Ineffective experiments
• Engineering approach
• Mistakes in data interpretation
• No planning and monitoring (floundering)
• etc.
Scaffolds in Go-Lab

• Orientation phase: Concept map
• Conceptualisation phase: Hypothesis/question scratchpad
• Investigation
  – Experiment design tool
  – Observation tool
  – Data interpretation tool
  – Error measurement tool
• Conclusion tool
• Reflection tool
Example Guidance (Scaffold): Hypothesis scratchpad
Go-Lab online laboratories

- Virtual laboratories
  - Mimic physical equipment in software

- Remote laboratories
  - Physical equipment that can be operated on a distance

- Data sets and their analysis tools
  - Data gathered in real experiments
Go-Lab repository
www.golabz.eu
Example Go-Lab environment

- The Go-Lab inquiry cycle displayed as tabs
- Prompts/assignments
- Scaffold for this phase
- Heuristics
- Generic tools
Go-Lab in one slide

Federation of online labs ....

.... embedding them into educational resources and guidance ....

.. to share with the community of users