Sharing online remote laboratory resources
- a new learning experience

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Sharing online laboratories

Experiences from using MIT WebLab in large classes (~350 students)

- What are critical issues for successful sharing?

- How do students perceive, relate to and use this new tool?

- How do we design courses to take full benefit from resources offered by sharing online laboratories?

So what is WebLab?

WebLab is a remote laboratory which is ...

- a cost effective way of opening up the laboratory hall for students 24 hours a day
- a cost effective way of making state-of-the-art equipment and devices available to students
- a measurement tool organized to simplify data aquisition and to minimize time spent on practical details
- more specifically, a MOSFET transistor characterization tool

WebLab graphical interface
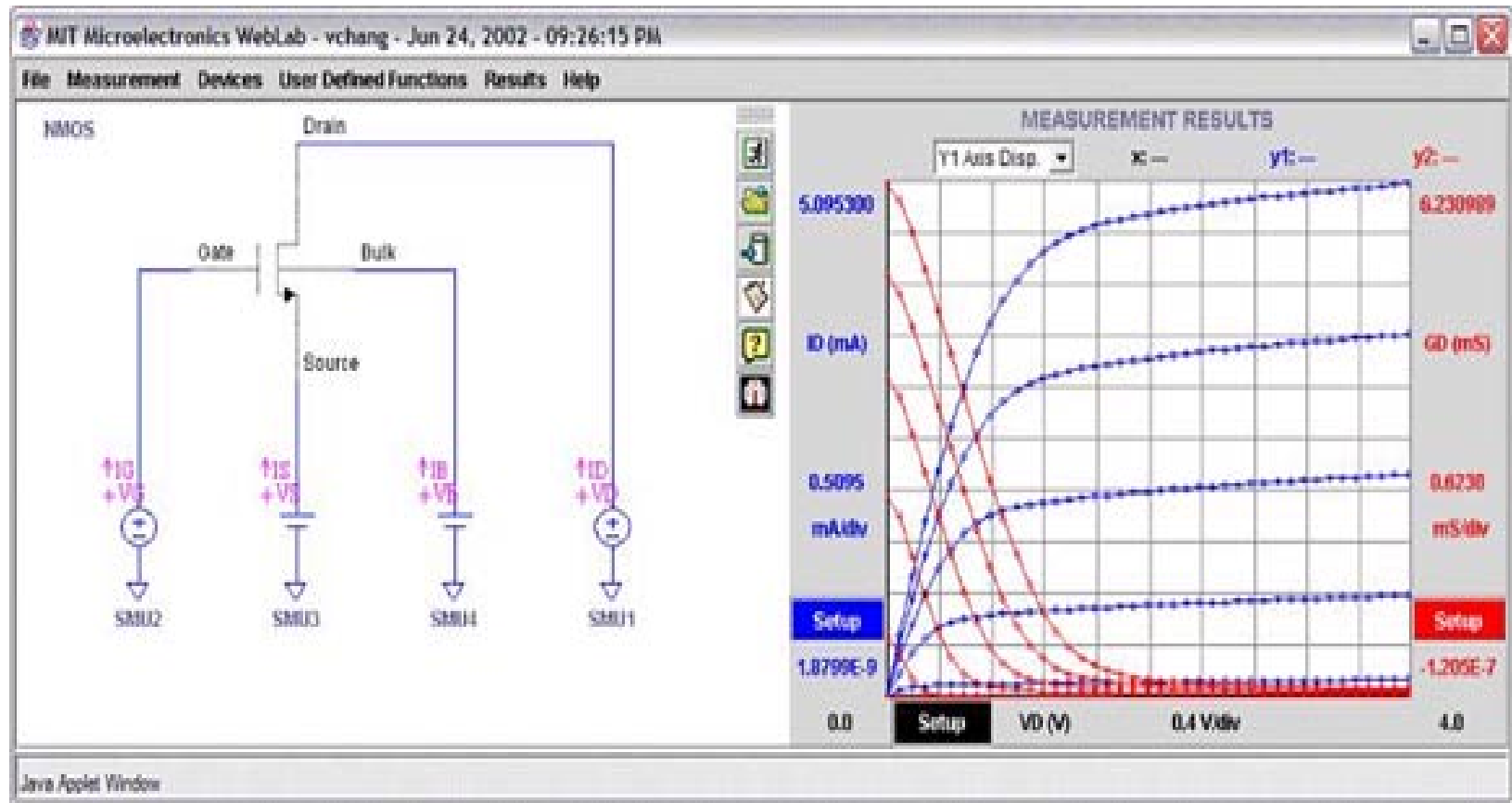
Critical issues for sharing

- Lecturer must set course focus so that resources offered by the online laboratory can be fully appreciated by the students
- Fast and efficient communication between host and user sites when system goes down or device is broken
- Simple and self-instructive graphical interface
- Easy access – no waiting time
- Dependable – the system must be available whatever time students have chosen for their lab session

Different learning tools complement each other

- adding online laboratory exercises to courses previously without hands-on exercises is one thing…

- ...and replacing traditional on-campus laboratory exercises with remote ones online is quite another

- The on-campus and the remote laboratories are two qualitatively quite different learning tools - just as listening to a lecturer is something else than reading a book

Can shared online laboratories help create a competitive learning environment?

- We choose to change a traditional closed-task laboratory assignment to an open task where students were expected to plan measurements themselves and to find important device parameters to study

- Exploring device properties and how to model them must be an integrated part of the course

Measurement task

The objective of using WebLab became an issue of moving student focus

- from handling instruments for collecting data
- to analysing (readily available) data by comparing experimental data to models

Measurement results expected to be presented orally

When did students login to WebLab?
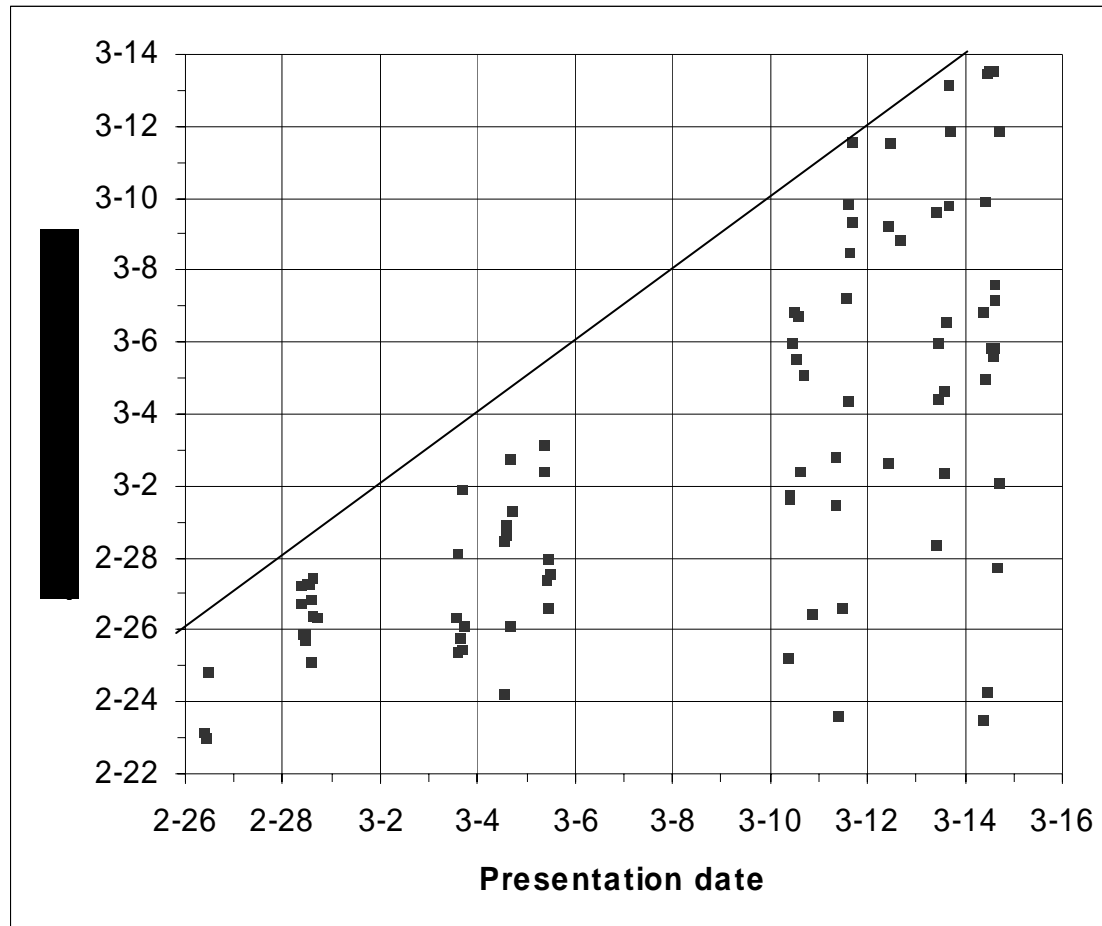
Positive comments on WebLab

- Access (43%):
  - "You can decide for yourself when to do the laboratory exercise!"
  - "means less stress!"
  - "gives opportunity to see how different settings affect results"
  - "offers flexibility – you can work from home at your own pace"

- Interface (19%):
  - "Clear graphs!"

- Real devices (16%):
  - "You get a feeling for realistic values"

- Repeated use (15%):
  - "Measure one day – think a bit – then measure again!"

- Methodology (9%):
  - "focus is on assignment, not on instrumentation or wiring"
  - "avoids many practical problems"

What students thought about WebLab
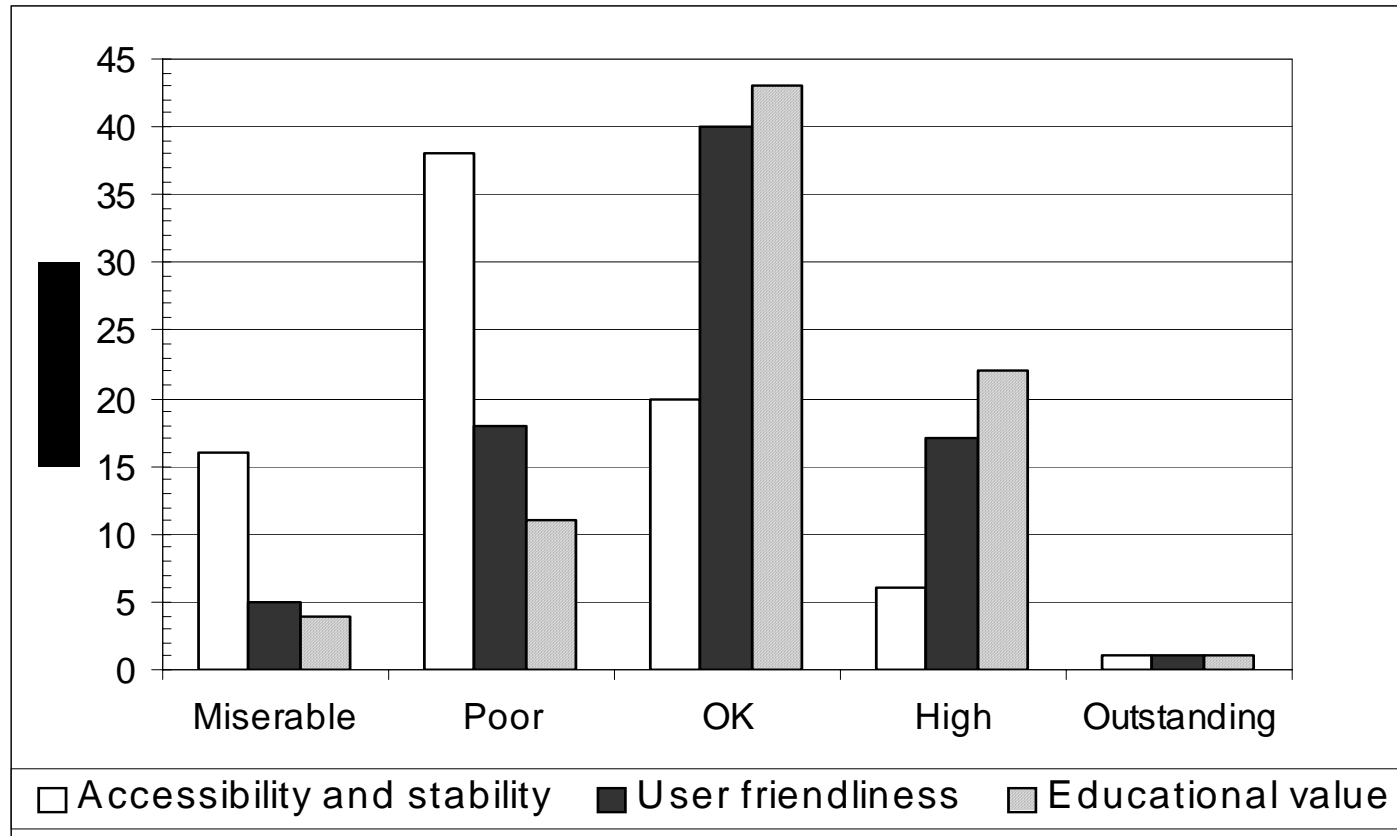
"Accessibility" and "Educational value" ratings not correlated

Comments from MIT about expected technical problems

- The use of WebLab in undergraduate courses at Chalmers was the largest and most ambitious deployment of WebLab to date

- This was bound to result in identification of new bugs and problems not seen before

Peak performance

- On February 25, 2003 between noon and 1 PM EST WebLab performed 134 characterization experiments in one hour – on average that means one experiment every 27 seconds

- This was a 35% increase over previous WebLab record

WebLab vs hands-on

- WebLab provides "practical" device experience... (which is appreciated by students)
- ...but it gives no instrumentation experience
- However, avoids hazzle with "boring" instruments
- For some students a real lab is always better – because then supervisor is available to assist and supervisor enthusiasm makes topic "easier" to grasp

Conclusions

- It is not trivial to design a course that takes full benefit from the resources offered by shared online laboratories

- Online laboratories are not replacements for traditional hands on laboratories

- The most important concern from the students´ point of view is that of accessibility

- On the negative side, lack of supervision when stuck on trivial matters is considered very frustrating by many students