

# The challenge of practical work in an eUniversity - *real, virtual and remote experiments*

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# Introduction

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- **Practical work forms a key part of University level education in many subjects**
- **Current and emerging trends in higher education present challenges as to how provide such practical work to the university students of tomorrow:**
  - the increasing use of the WWW in educational delivery
  - the move towards a "flexible university" approach
  - the growing need to deliver life-long learning
- **Will require flexibility in time, place and access to specialised equipment**

# Practical work - a key component of many university level courses

- **The educational objectives for providing practical work include:**
  - To provide illustration and demonstration principles taught in lectures
  - To motivate students and as a focus for student-student/student-tutor interaction
  - The development of practical skills seen as important for professionals in the subject area
  - The development of collaborative and team working skills
  - To introduce students to the "community of practice" of engineers or scientists
  - To give a context for the teaching of data analysis

# Pressures on provision of practical work

- There are increasing pressures on the provision of practical work in higher education from:
  - Increasing student numbers, or insufficient numbers for the viability of some activities
  - Professional institutions and prospective employers demanding students learn up to date techniques and to use modern equipment
  - Issues of student timetables that are increasingly more tailored and flexible
  - The increasing economic pressures on educational provision, always an under-resourced area

# Responses to practical work provision in distance/eUniversities

## ● Traditional

- Face to face labs
  - Residential schools
- Home experiment kits
  - Limited scope
    - *Safety issues*
    - *Costs*
    - *Logistics*



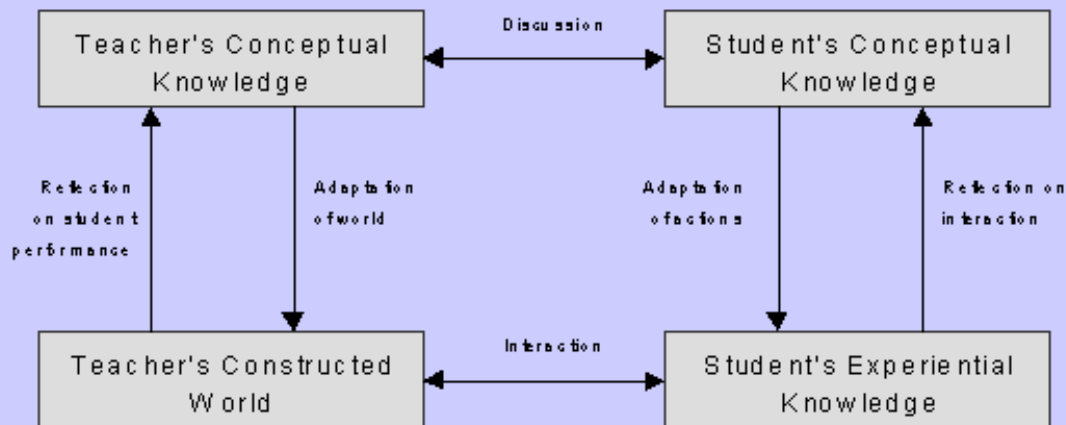
## ● Emerging

- Virtual Science
  - Simulated or recorded experiments on CD-Rom or over WWW
- Remote Labs
  - Real-world experiments interacted with over the WWW

# Pedagogic Issues

- **The support of effective teaching and learning must be primary concern in any innovation in the provision of practical work**
  - Any use of technology must serve this objectives
- *Constructivists'* theories highlight importance of practical work
  - It is essentially learning by doing
- Technology can support effective learning, however it can get in the way of effective engagement
- Collaboration with other students is also key
- The boundaries between traditional and distance university teaching are blurring

# Laurillard Conversational Model

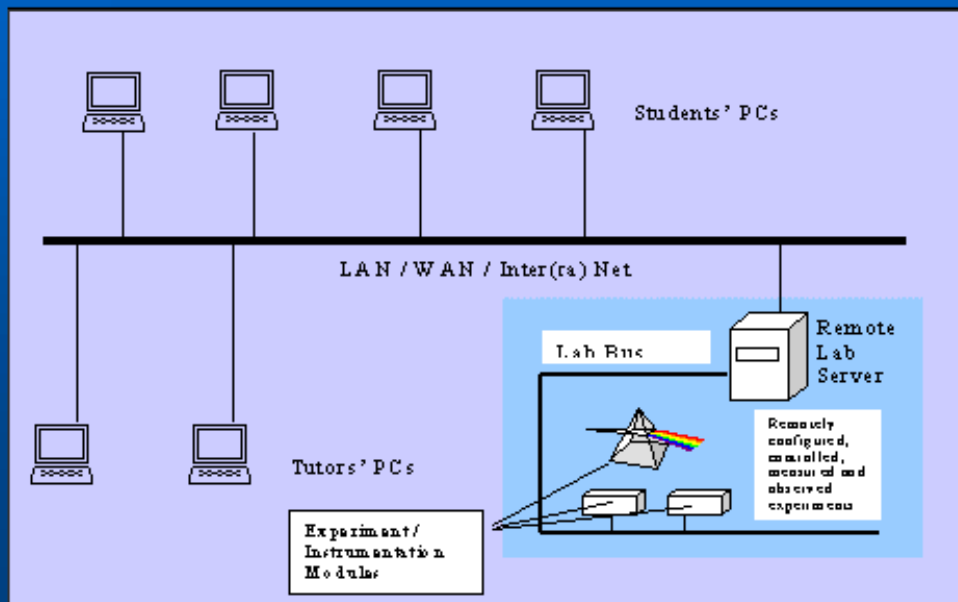


# Comparative Critique

- **Lab experiments**
  - Supports all interactions of model
  - Difficult to provide in distance learning context
  - Economic and logistic challenges
- **Virtual science**
  - Only some interactions of model supported
  - Issue of credibility
  - Good for science principles but not practice
- **Remote controlled labs**
  - Overcomes many of limitations of virtual science
  - Not able to reproduce *gestalt* of lab
  - Higher cost than virtual science



# Schematic of Remote Experiments System



# Conclusions

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- Current trends in higher education present a real challenge to the provision of practical work
- However the value of such work is almost universally recognised
- Thus as we move towards more on-line delivery we need to adopt approaches that still make available to students experimental work conducted in the "real-world"
- The remote control over the WWW of a teaching laboratory or an experimental facility offers potentially significant benefits here
- In 10 years time this could be the primary mode of conducting teaching experiments