The revolution of schooling?

Changing patterns of teacher-student interactions in the era of new technology

Visions and realities.

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Personal background

- Professor of education at Göteborg University, Sweden
- Adjunct professor of information science at University of Bergen, Norway

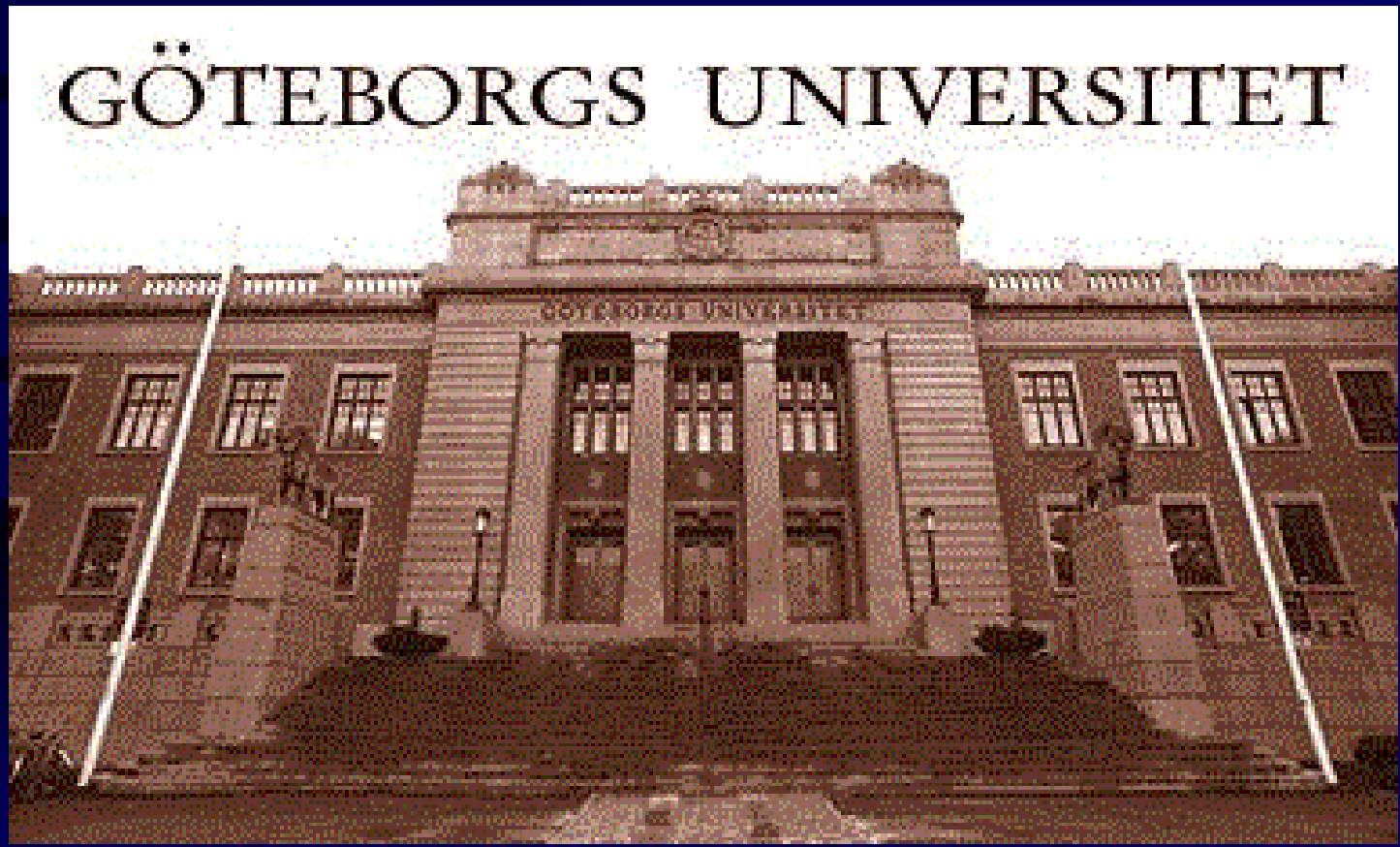
Personal background

- Advisor to the vice-chancellor on IT
  - Infrastructure
  - Administrative support systems
  - ICT for learning
  - Staff development
- Board-member of the Swedish National Agency for Distance Education, SUNET and Ladok.

This is Sweden

This is Göteborg

This is Göteborg University



This is Faculty of Education

The Swedish school system

- Sweden has a decentralised school system.
- Curricula and syllabi are goal-oriented.
- Both the school and the individual teacher are responsible for deciding how to work in order to reach the goals set.
- Teachers are employed by the municipalities and the municipalities are responsible for the education sector as a whole (except higher education).

Agenda

- Observations on policies, ideologies and promises
- Observations on reality

Outline of the seminar

- Penetration of new technology in the Swedish society.
- Changes in pedagogical ideologies and rationales
- The conditions for "institutionalising" ICT
- Contemporary Swedish initiatives of introducing Information and Communication Technologies (ICT) in the Swedish educational systems.
- Pedagogical rationale(s) behind these initiatives

Bottom line

- Large programs to promote usage of ICT in schools
- Rhetoric – a belief in “the good effects” on society and a unavoidable track
  - You can’t not not do it (Collis & Moonen, 2001)

Rhetoric - technology

- ICT will completely change the conditions for schooling
  - "The gigabit net will change the conditions for education"
  - E-learning is the new mood of learning

Rhetoric - schooling

- New opportunities (for everything)
- New pedagogical methods
- Schooling should be an authentic practice
  - Problem based/oriented
  - Exploration
  - Children construct their knowledge
- Collaboration
- Life-long learning
- Democracy (reaching more and new students)

Important patterns of change *in society* with regard to ICT

- Expansion of high-quality ICT-infrastructure
- Increased functionality of ICT-tools
- Commercialisation of ICT
- Merging of mass-media and ICT
- Increased use of ICT in everyday life and at work

Expansion of high-quality ICT-infrastructure

- Access to computers at home (2000)

Age	%
9-14	83%
15-19	80%
20-24	63%
25-34	78%
35-44	81%
45-54	77%
55-64	51%
65-79	23%
Tot	64%

Expansion of high-quality ICT-infrastructure

- Access to computers anyware
  - 94% of students 15-24 (1998)
  - A digital divide: workers, retired, unemployed.

Expansion of high-quality ICT-infrastructure

- Access to Internet at home
  - 50% of the population (1998)
  - 78% in the agegroup 15-24 (1998)

Increased functionality of ICT-tools

- More powerful hardware
- Improved interfaces / userfriedliness
- More powerful tool for production

Commercialisation of ICT

- Information-services
- Communication-services
- Games
- Edutainment
- Multi-media

Merging of mass-media and ICT

- New standards for communication and presentation
- Changing ontologies and epistemologies
  - what is (important) knowledge
  - how do you gain this knowledge

Increased use of ICT tools in everyday life, at work and in school

- Computer use at home on a single day (1999):
  - 39% (15–19)
  - 26% (20–24)
  - 33% (25–34)
- Average using time: 1 hr. (1999)
- Use of Internet (home, school, work) (1999)
  - 31% of total pop on a single day.
  - 45% (15-24)

Increased use of ICT tools in everyday life, at work and in school

% of students accessing the internet from school

Country	**@school**
Sweden	78%
Canada	74%
Taiwan	63%
UK	59%
US	59%
Japan	28%
Italy	28%
Germany	25%
France	25%
Urban China	13%

Conditions for adopting ICT in schools

- Infrastructure and services
- Teacher and student competences
- Use of ICT as a professional content and tool
- Institutional culture and individual mindsets
- Pedagogical ideas and approaches

ICT in schools - infrastructure

- High quality highways
- Schools have general access to Internet
- Teachers
  - Access to computers/networking at the workplace (public computers)
  - Access at home through private initiatives and special programs
- Students
  - Access to computers/networking at school
  - Workplaces never enough for students

ICT in schools – support

- Access to technical support is a crucial factor, generally noted by teachers and students.
- Support for utilizing the pedagogical potential of the computer is sought for

ICT in schools – ICT-literacy

- Most teachers and students have basic knowledge and skills of using the computer as a ***personal tool***, but are not proficient
- Subject-matter related competence is more developed
- Competence in using ICT for pedagogical purposes is not very high
- But habits of using ICT on en everyday basis are more and more common

Institutional culture and individual mindsets

- Attitudes towards “new” technology (Becker)
- Work routines (Ekeblad et. al., Juhlin-Svensson)

Pedagogy - ideas and approaches

- Pedagogical philosophy and and amount and type of use co-vary (Becker; Juhlin Svensson)
- Examination forms/institutionalised demands is crucial for how students work (Bergqvist & Lindström; Lindström, Marton, Laurillard et. al.)
- The emergence of a new paradigm

Pedagogy – the emergence of a new paradigm

- From teaching to learning
- Problem-based learning
- Flexible learning
- Distance-learning
- Changing relations teacher – student - tools

Pedagogy – the emergence of a new paradigm

- Focus on:
  - The individual student
  - The individual in the context of the group
  - Learning as *knowledge construction* in specific subject-matter areas
  - Activities (processes of learning), not only outcomes

Pedagogy – the emergence of a new paradigm

- Focus on
  - General problem solving skills
  - Communication
  - Collaboration
  - Knowledge and skills

Pedagogy – the emergence of a new paradigm

- Focus on
  - Resources for learning – not teaching learning materials
  - Media technologies / ICT as not just complementary

Swedish initiatives

- Large programs to promote usage of ICT in schools
  - National Board of Education
  - KK-foundation
  - ITiS (The Delegation for IT in Schools)

National Board of Education

- Governmental reports on
  - Software
  - Computer literacy
- Pedagogy
  - The Computer and the School project (DOS)

KK-foundation

- 27 communitiy projects
- >100 school projects
- Improving quality of
  - ICT-infrastructure and services
  - ICT -competence
  - Pedagogical tools and usage
  - Organizational restructuring

Evaluations

- It is very difficult, not to say impossible, to make the vision of changing students' learning come true
- Not enough to run and implement projects
- Development must be linked to changes in teachers ways of working
  - Teamwork for teachers
  - Problem-based or project-based pedagogical agendas
- ICT per se does not change

The Delegation for IT in Schools

- 1999-2003

The Delegation for IT in Schools

- in-service training for 70,000 teachers in teams
- a computer for participating teachers
- state grants to improve the school's accessibility to the Internet
- e-mail addresses for all teachers and pupils
- support for developing the Swedish Schoolnet and the European Schoolnet
- measures for pupils with special needs
- awards for excellent pedagogical contributions

The Delegation for IT in Schools

- Equal standards between schools and quality for pupils
- School development
- Supplementing and reinforcing programmes planned and already completed by the municipalities.
- Increasing the school's accessibility to the Internet and e-mail

The Delegation for IT in Schools

- Pedagogically-oriented in-service training for teachers in teams
- To support implementation of this, the following will be arranged:
- A course in basic use of computers for teachers - with little prior experience of computers - in participating teams
- Seminars for school politicians and administrative heads
- Training for those persons who will function as facilitators for participating teams
- Training for head teachers at schools with participating teams.

Evaluations

- Teamwork problematic
- Reification of ICT and ICT-pedagogy
- Difficult to institutionalise and even to implement in the class-rooms
- Slow process

How does it work in schools and in the class-room?

Some examples

Example: E-learning - new mode(l)s of learning

- On-line problem-based learning – student activity and the formation of goals
  - Upholding the asymmetry between teacher and students
  - The interchange of form and content

Example: E-learning - new mode(l)s of learning

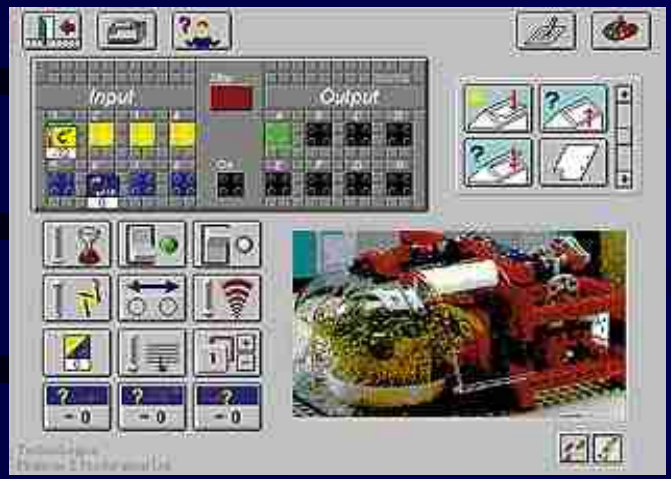
- Videoconferencing – the extended class-room
  - The importance of control
  - Good teaching – thought through planning
  - Break-down of communication

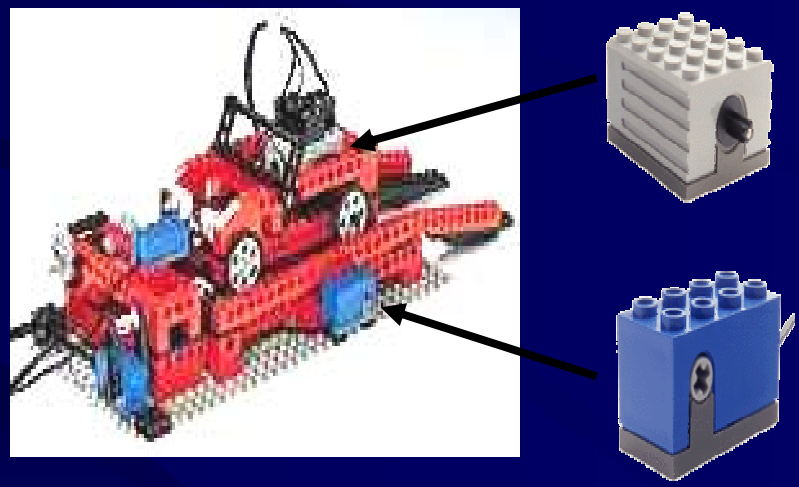
Example: Pupils search on the Internet

- Challenge to teacher authority
  - De-classification of teachers
- Challenge many teachers demand for control
  - Of content
  - Of activity
- Students are cutting and pasting
  - “Knowledge in pieces” - amplification of a specific epistemology

Example: Exploraration and discovery in the classroom?

Working in a “constructionist” learning environment





Working in a “constructionist” learning environment

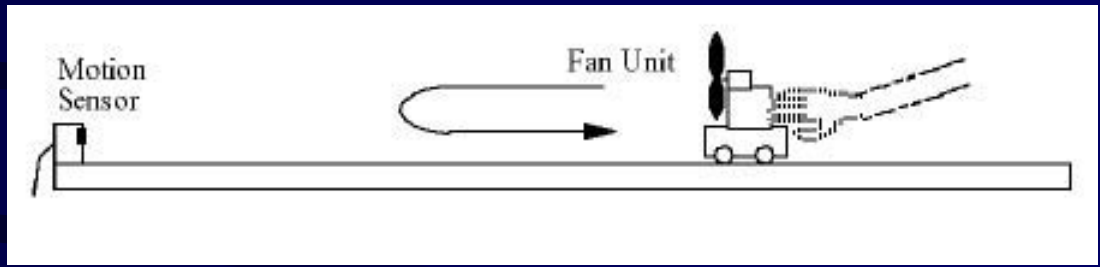
- Students do engage in “exploratory talk” (Mercer), but the focus of the talk is not the subject matter, rather the “school-meaning” of the task, in their attempts to “frame” (Goodwin) the situation
- mainly by asking the teacher.
- The teacher is
  - a resource, but also a
  - a coach or a supervisor that guides the student as to what to do and how to do it
  - And sets the criteria for good performance

Example: Microcomputer-based laboratories

- Mechanics and mathematical/symbolic modeling

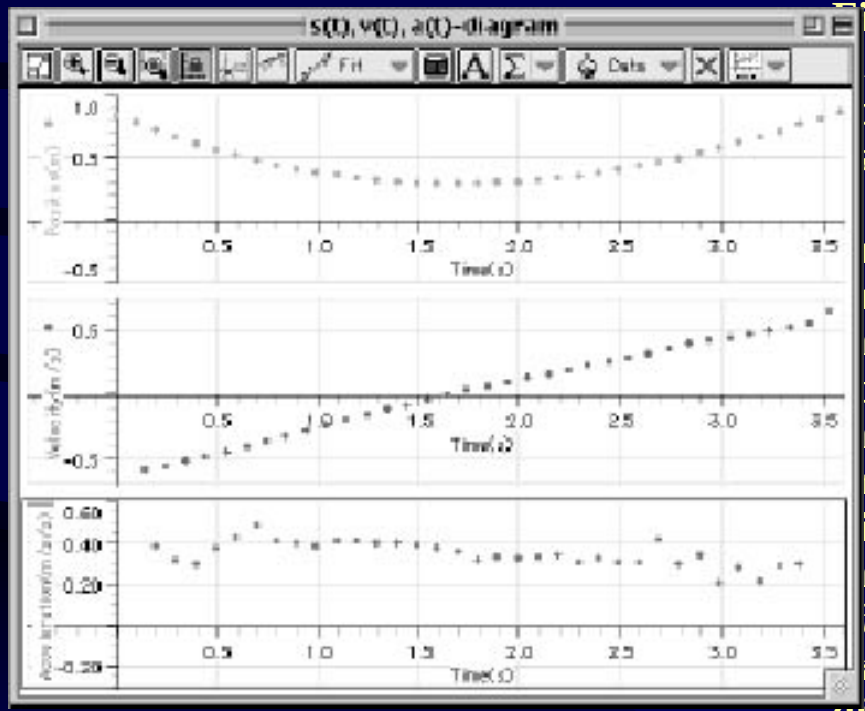
Example: MBL

The MBL-environment



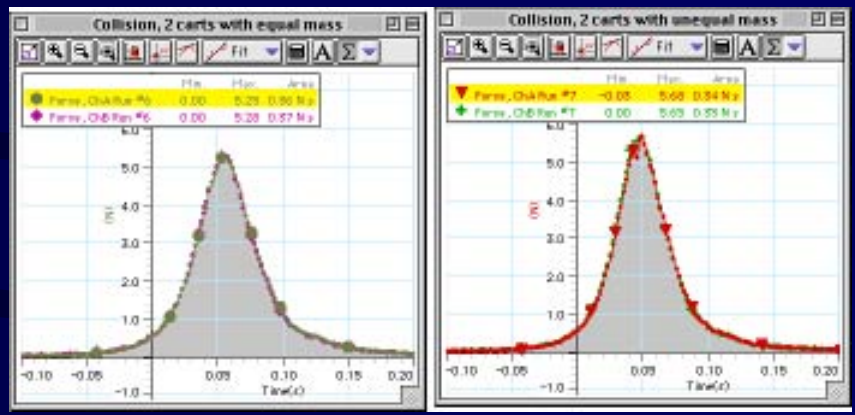
- **Figure 1. Typical setup of a MBL-experiment. A low-friction cart is pushed towards a motion sensor. A fan unit attached to the cart provides an approximately constant force in a direction opposite to the initial movement and the cart will thus change its direction of motion. The results are shown in Figure 2. Note that the fan unit provides a visible force.**

The MBL-environment



igure 2. Results of the MBL boratory shown in Figure 1. The osition, velocity and acceleration s functions of time are displayed. common misconception is that he cart has zero acceleration at the urning point. Another common isconception is that the cceleration is in the direction of otion (see the poor results on the re-test for "coin acceleration" in igure 4). By asking the students to ake a prediction and sketch the *t), v(t)* and *a(t)* graphs *before* the xperiment and by the rapid isplay of the experimental results these misconceptions can effectively be addressed.

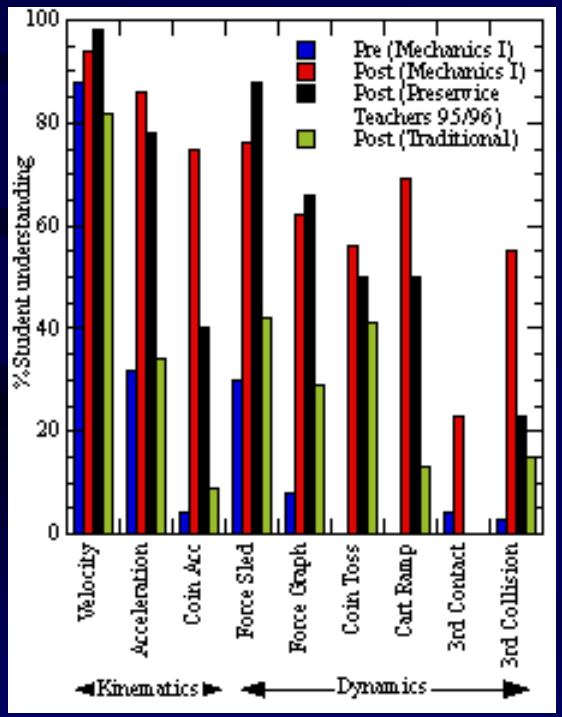
The MBL-environment

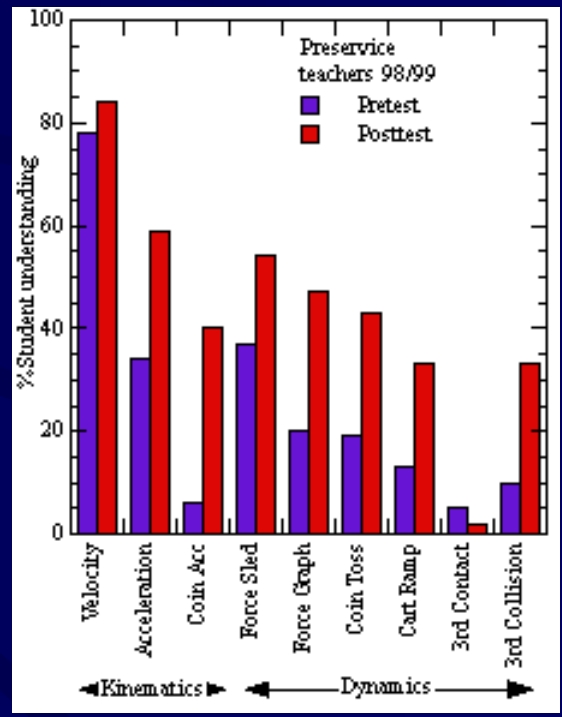


- **Figure 3. Results from an MBL-experiment with two colliding carts with equal and unequal masses respectively. Force sensors are mounted on top of each cart. The graphs show the forces measured by the sensors during the collision and the area below curves. Note the time scale. Most students are surprised to discover that the forces are equal when the carts have different masses.**

Example of results – Thornton

- **Conceptual understanding in mechanics as measured by the FMCE-test.**





Example of results - Thornton

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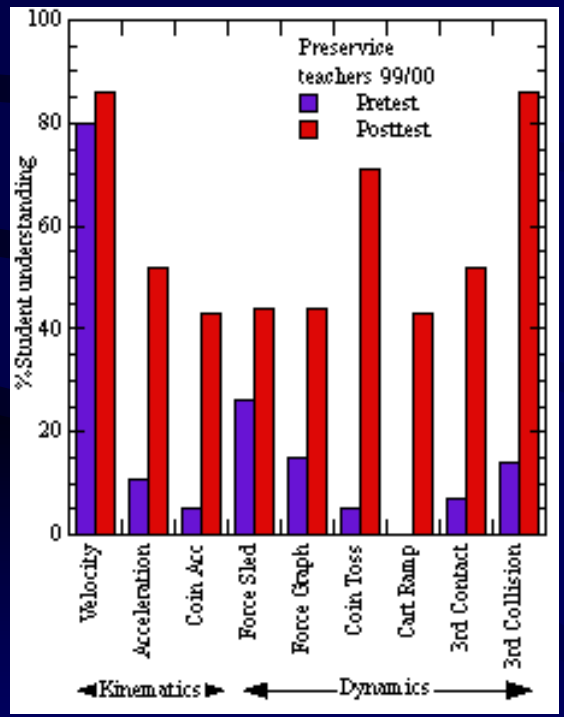
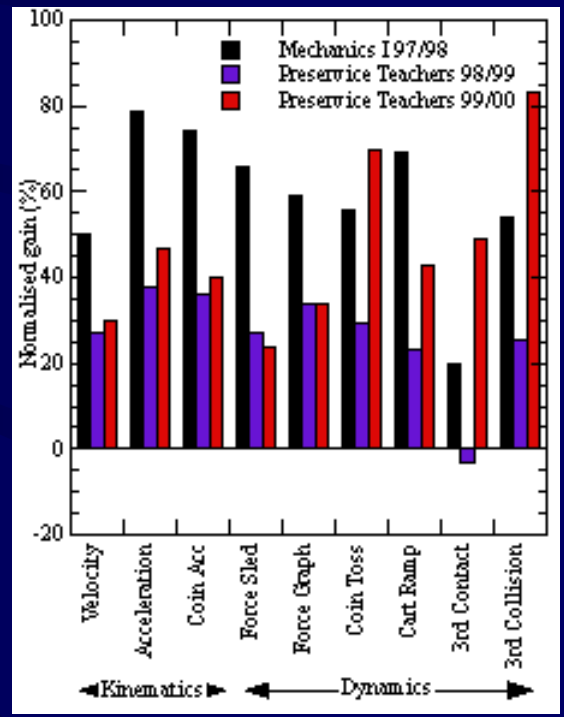
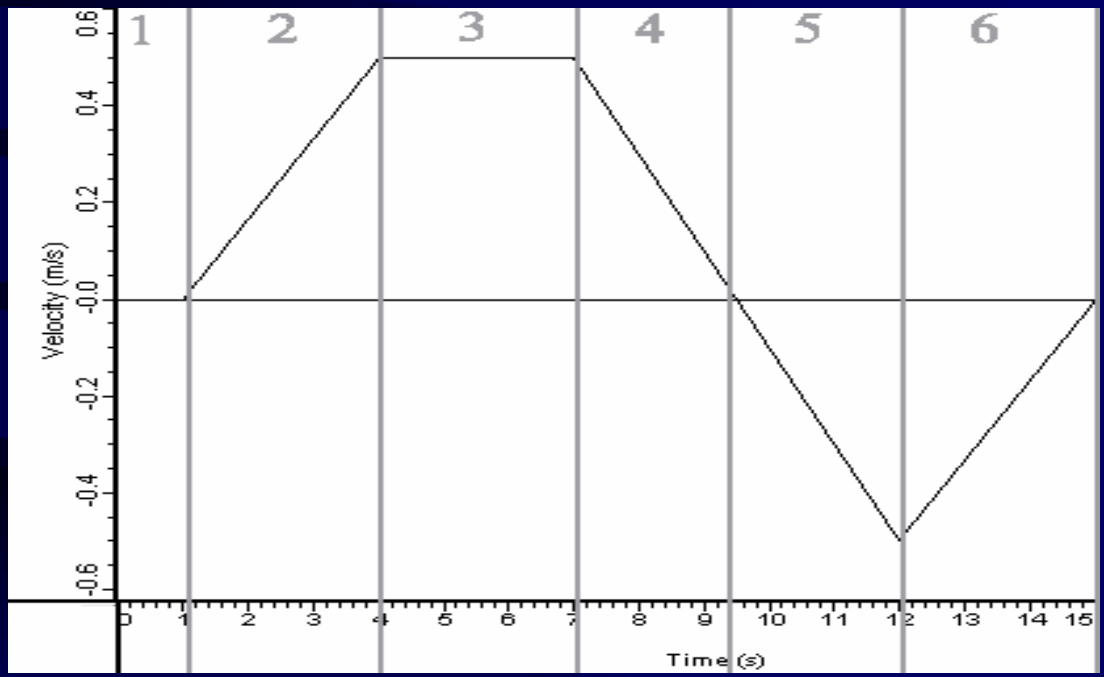




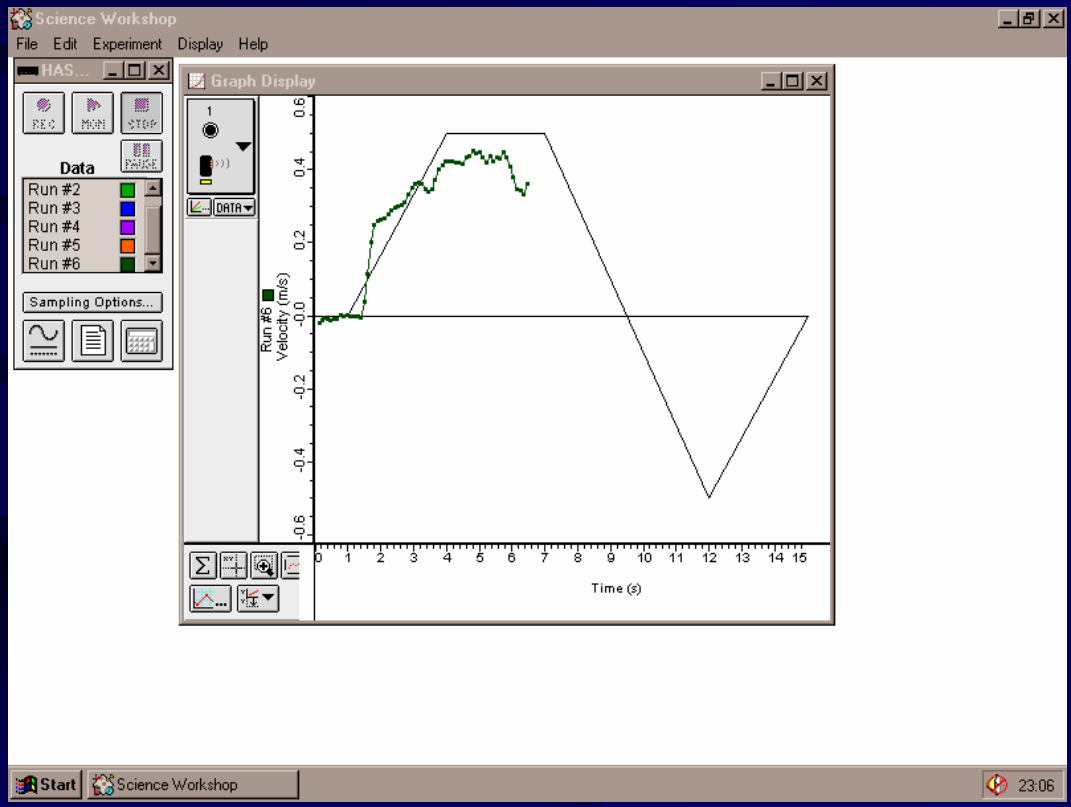
The MBL-environment – Why is it effective

- The learner is part of a dynamic interaction with a system that makes the consequences of actions visible
- The sensuous and the conceptual are integrated through symbolic representation of simultaneous bodily experiences
- Interactions with other people decisive
- Understandings are promoted by experiencing certain patterns of variation
- Patterns of variation/focal awareness are promoted by task structure and/or teacher intervention

Example of task



Example of task



Results

- The specific task structure and task representation is crucial
  - The graph “phase” the learning process
  - Subjects try to “smooth” the registered graph
- An important part of communication is non-verbal and indexical
- The teacher fit into the task structure – important for
  - refocusing students
  - setting criteria for
    - how to work and
    - what’s right and wrong

Summing up

- The didactical use of ICT is of minor importance.
- ICT is much more a tool for personal productivity.
- Empirical observations of the introduction of computers in education tell us that, so far, the changes of basic pedagogical forms are not very revolutionary.
- Technology push pedagogy to a very little extent. The major finding is that new technology is used to “re-dress” old pedagogies.

Summing up

- The administrative use of ICT is basic
- Access to a developed infrastructure is necessary, but not sufficient.
- More important are general usage (habits) of ICT and societal “ICT-literacy”.
- The single most important factor in schools is the examination procedures used.

Summing up

- New ICT-based tool for production of “text” (multimedia), information search and handling, and communication will probably make a difference in the longer run.
- Teacher roles are changing
  - Less a presenter
  - More
    - Designer of learning environments
    - Guide
    - Master?
- The digital divide is a real problem!