

GERMAN - ISRAELI PROGRAM
in the Field
of VET



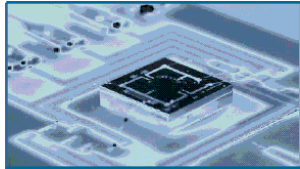
MST
Micro Systems
Technology

German Israel Project in Microsystems Technology (MST)

T a g u n g
Aus- und Weiterbildung in Hochtechnologiefeldern
Berlin 29-Nov-2007

Franz Derriks

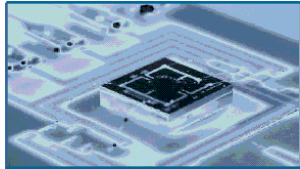
Last Revision: 26-Nov-2007



InWEnt gGmbH



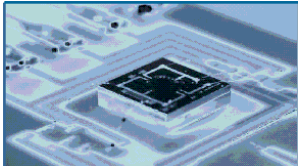
- Organisation for international human resources development, advanced training and dialogue
- ...which promotes sustainable social, economic and ecological development all over the world by realizing international and intercultural training for young professionals, experts and managers



InWEnt gGmbH



- ...founded 2002 through merger of
 - Carl Duisberg Society (CDG) e.V. and
 - German Foundation for International Development (DSE)
- Shareholders
 - Federal Republic of Germany, represented by the Federal Ministry of Economic Cooperation and Development (BMZ)
 - CDG e.V., representing the economy
 - DSE representing the Länder (Federal States)

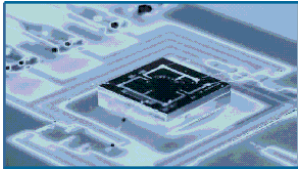


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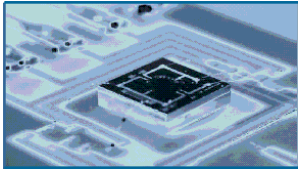




German – Israeli Cooperation Program in Vocational Education and Training

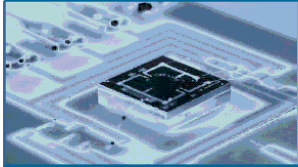
- funded by Ministry of Industry, Trade and Labour (Israel) and Federal Ministry of Education and Research (Germany)
- established in 1969
- more than 1,400 Participants ever since

www.inwent.org/israel



Working Methods in Cooperation

- theme-based workshops
- cooperation in project teams
- annual seminar aims at linking the programme to science



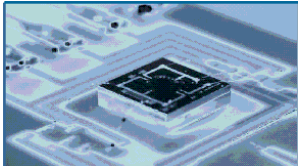
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Example: Mechatronics Project 1999 - 2003





Participants



Rupin Institute for higher Education
Heidera



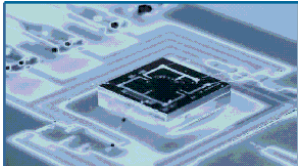
Ort Braude College Karmiel



Tel Aviv University

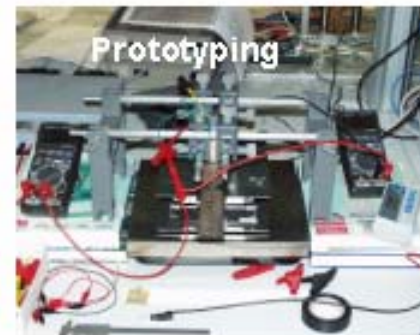
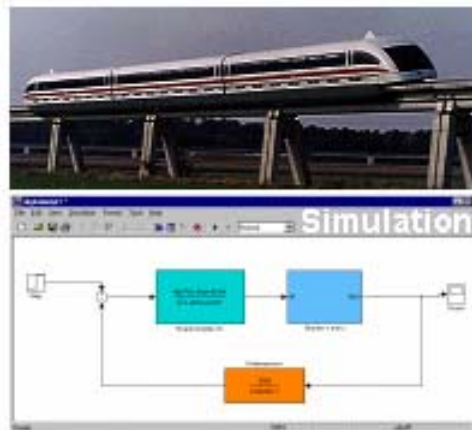
Ministry of Labor Trade and Social Affairs

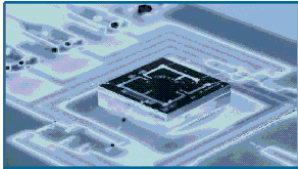




Activities

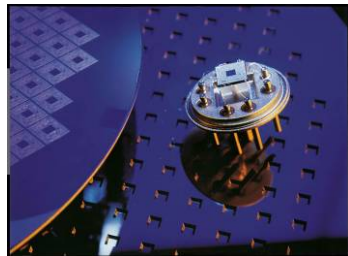
Development of curricula and teaching materials





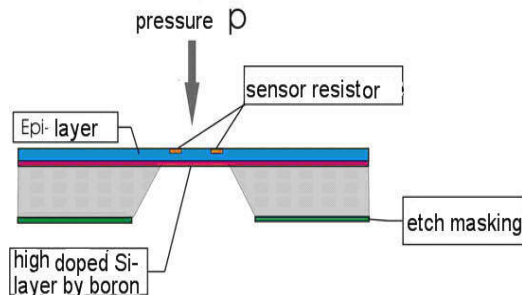
Micro Systems Technology (MST)

(or Mechanical and Electrical Micro Systems, MEMS)

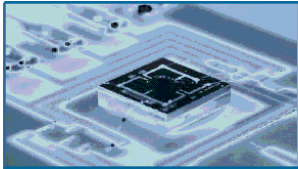


Quelle: Bosch

- deals with the design and production of mechanical, electronical, fluidical or optical components in dimensions of μm mostly on the base of silicon in clean room processes
 - examples are sensors, actors, micromotors or analysis systems in the biology, chemistry or medicine
 - there are typical clean room processes for production of ...
 - ◆ mechanical elements like channels, cantilivers, membranes or beams
 - ◆ electronic components like resistors, conductors, isolators, capacitors, coils or pn-junctions for signal processing



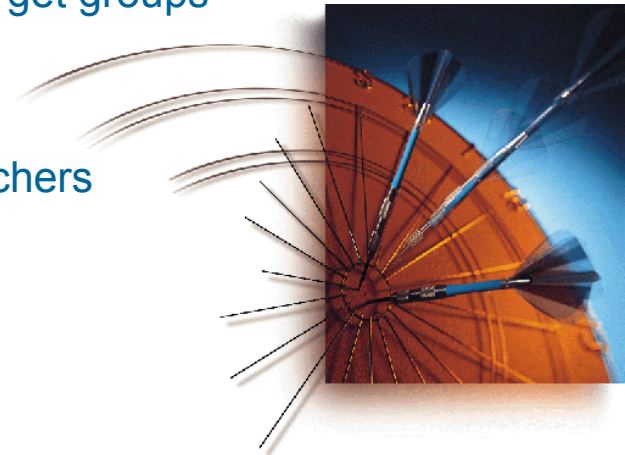
Quelle: Bfz-Essen

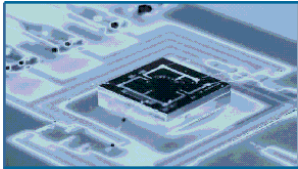


General Project Goals

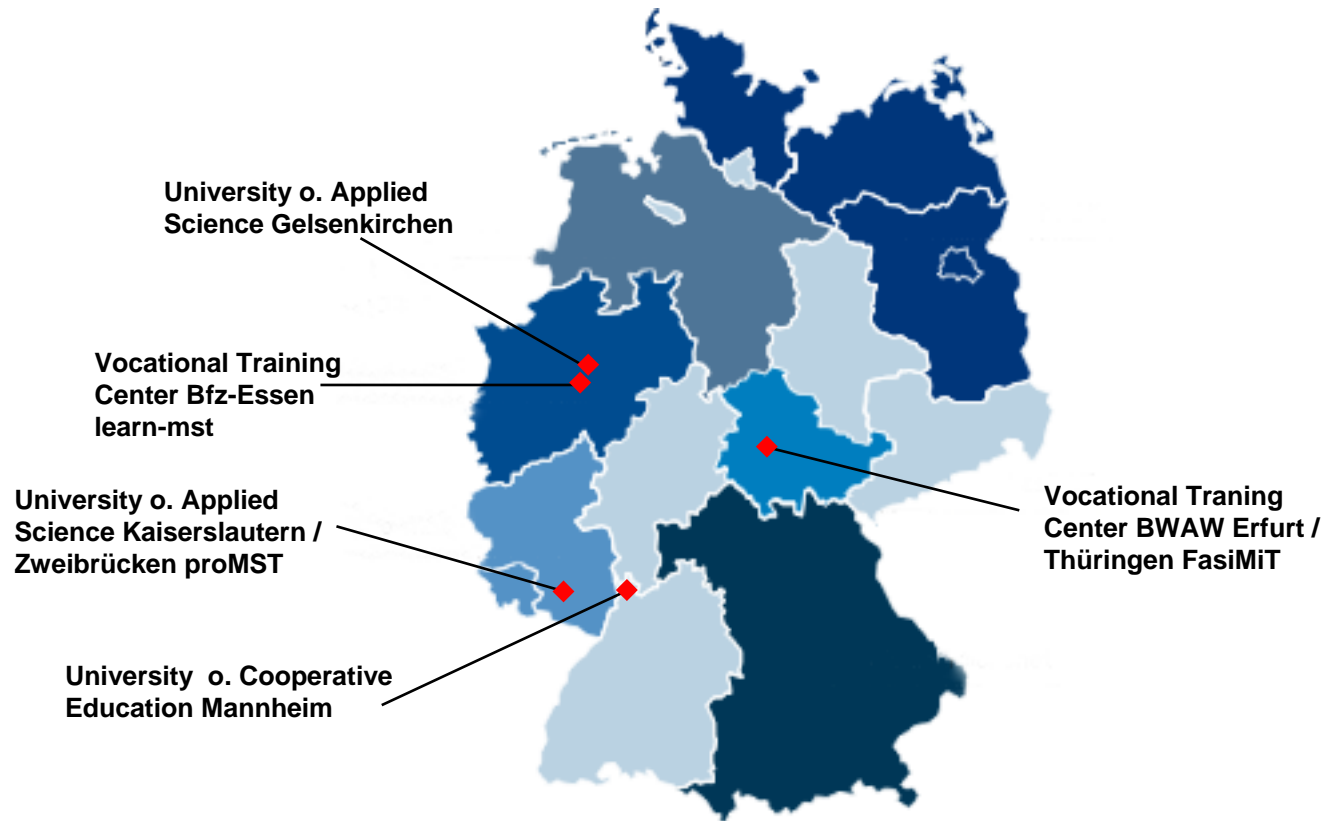
- Cooperation in...

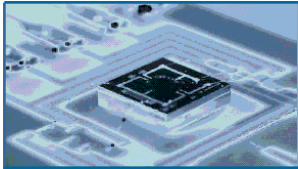
- exchange of curricula for different target groups
- development of training concepts
- development of training materials
- further education of trainers and teachers
- evaluating of training concepts





Involved Institutions in Germany



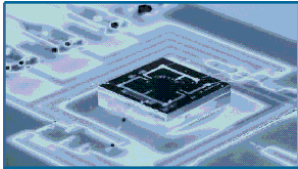


German Team

- Franz Derriks, Representativ of Bfz-Essen e.V.
- Prof. Kay Wilding, University of Cooperative Education Mannheim
- Prof. Dr. Lilienhof, University of Applied Science Gelsenkirchen
- Prof. Dr. Antoni Picard, University of Applied Science Zweibrücken
- Marion Wadewitz, Dietmar Naue, BWAU Thüringen

Israel Team

- Israel Zilberstein, Open University of Tel Aviv
- Ari Livneh, Ministry of Industry Trade and Labor
- Moshe Amir, Ministry of Industry Trade and Labor
- Dr. Rephael Yahel, Center of Education Technology (CET)



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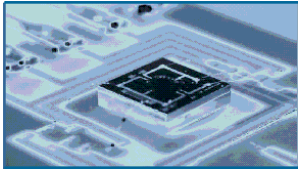
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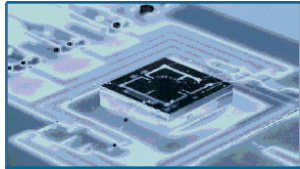


K.Wilding A.Livneh R.Yahel A.Picard M.Amir
H.J.Lilienhof M.Wadewitz F.Derriks I.Zilberstein D.Naue



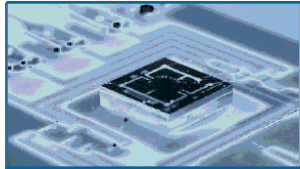
Activities in 2007

- First workshop in Germany 7 Oct – 13 Oct 2007
 - Visit of training centers and universities on different level
 - ◆ Vocational Training level, Bachelor's and Master's level
 - microsystems factory Dortmund
 - Discussion and design of the next common project activities in 2008

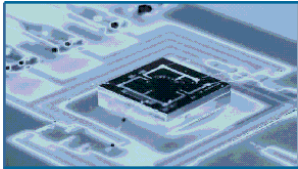


Planned further Activities

- Development of training systems in Israel aimed to
 - Specialisation for **practical engineers**
 - **Academic retraining**
 - **Vocational training** of unemployed people
- For each training system development of
 - Curricula, teaching aids and materials
 - Design of laboratory experimentation and final project
 - Experimental run, **evaluation** and assessment
- Development of **didactical materials** for self study in design and production of MST components
 - Design and production of a pressure sensor
 - Design and prototyping of a flow sensor
 - Construction, function and production of solar cells

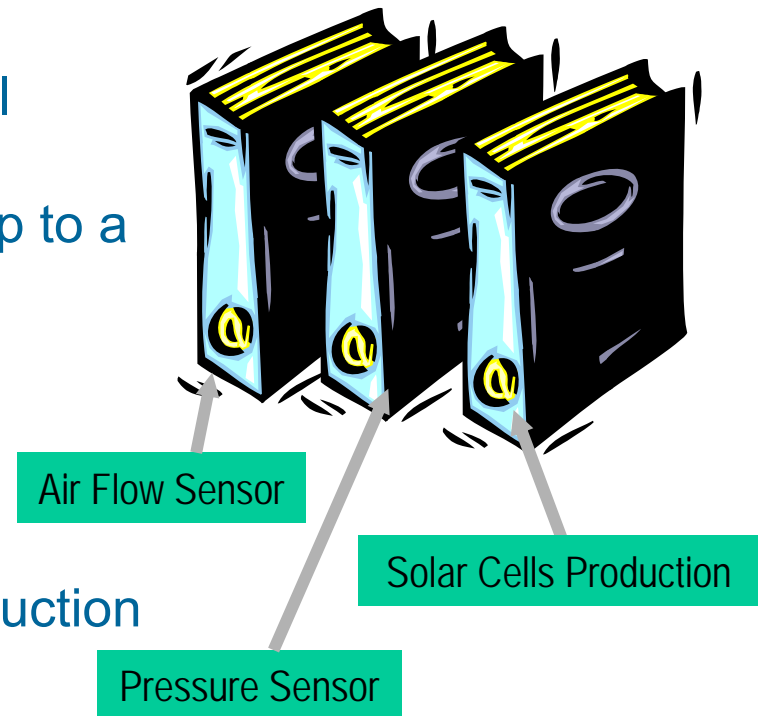


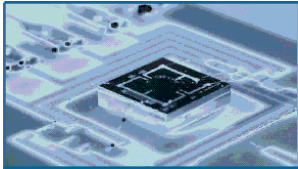
- **Train the trainer activities**
 - Lectures in education methods and means in MST
 - Practical training in MST production (clean room experience)
- **Further development of the concept of the **Virtual LAB****
 - Functionality and courseware dealing with clean room equipment and processes
 - Design of a common development project



Didactical Materials

- Focusing to a typical and general understandable MST application
- Leading the students step by step to a deeper understanding
- Including of basic knowledge in physics, chemistry...
- Explaining of design steps and simulation aspects
- Prototyping and planning of production
- Quality test





mst-components
or products

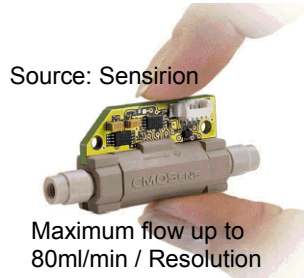
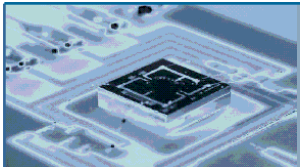
Didactical Approach

Training Objectives

Target Groups



		Objects	Tools, Methods	Requirements of work	Training objectives
No specialists		Application			General understanding
Skilled worker in the production		Production process	Production steps, systems and machinery	Understanding the interaction in processes, operating	Operating competence, assurance of quality, environmental protection
Technician or Practical engineer		Principles, physics, qualities	Function ckeck and measurement technique	Handling of measurement equipment	Application knowledge
Academic professions		Theory and applied science	Mathematics and modelling	CAD, modelling, simulation	Design knowledge



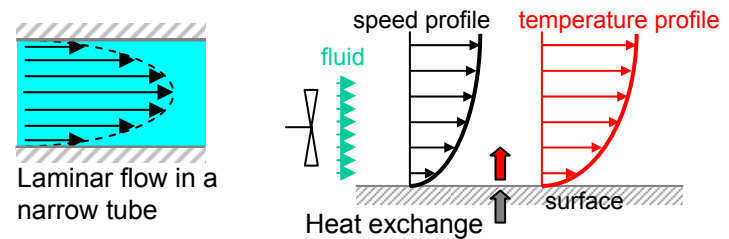
Maximum flow up to 80ml/min / Resolution down to 2 μ l/min



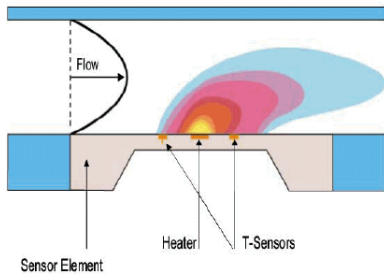
Source: Medtronic insulin pump

Example: Flow Sensor

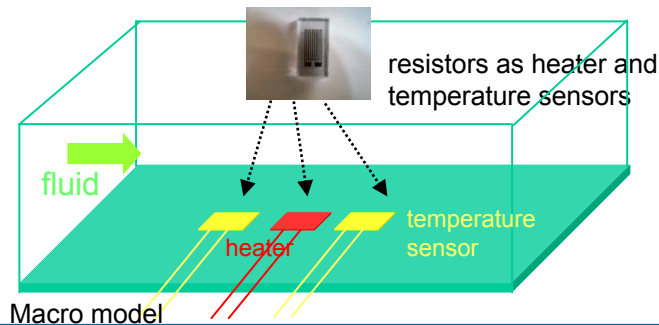
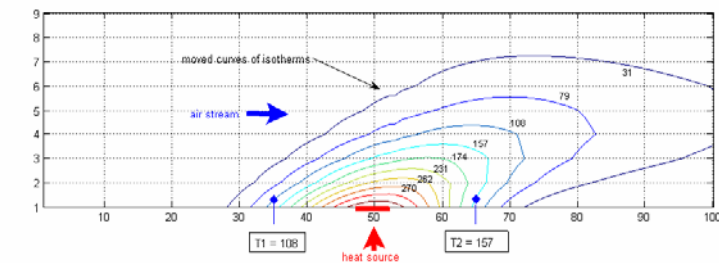
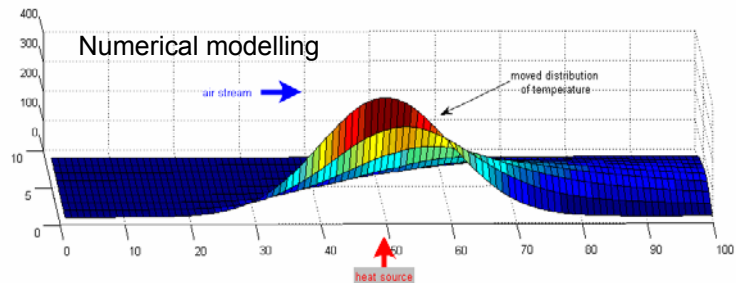
(application, physics, modelling, simulation, production)

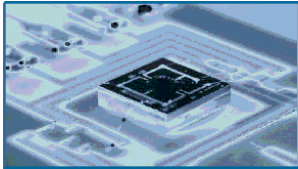


Quelle: Sensirion

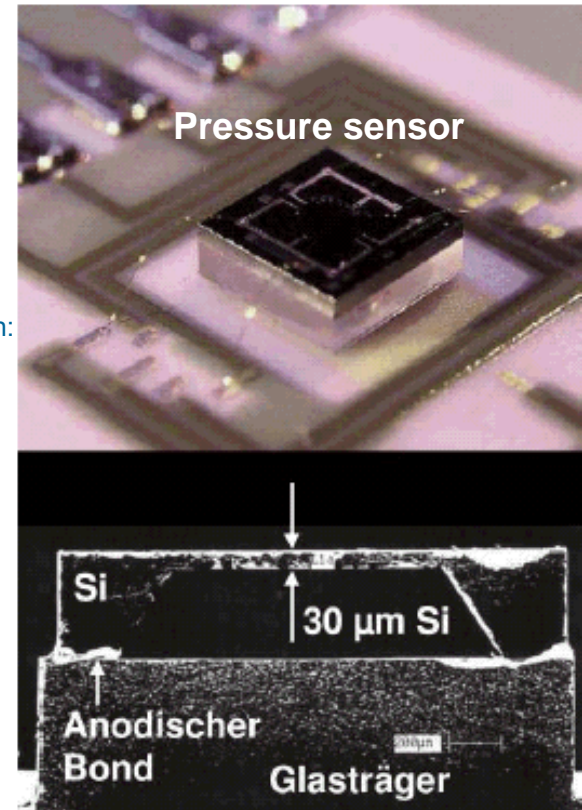
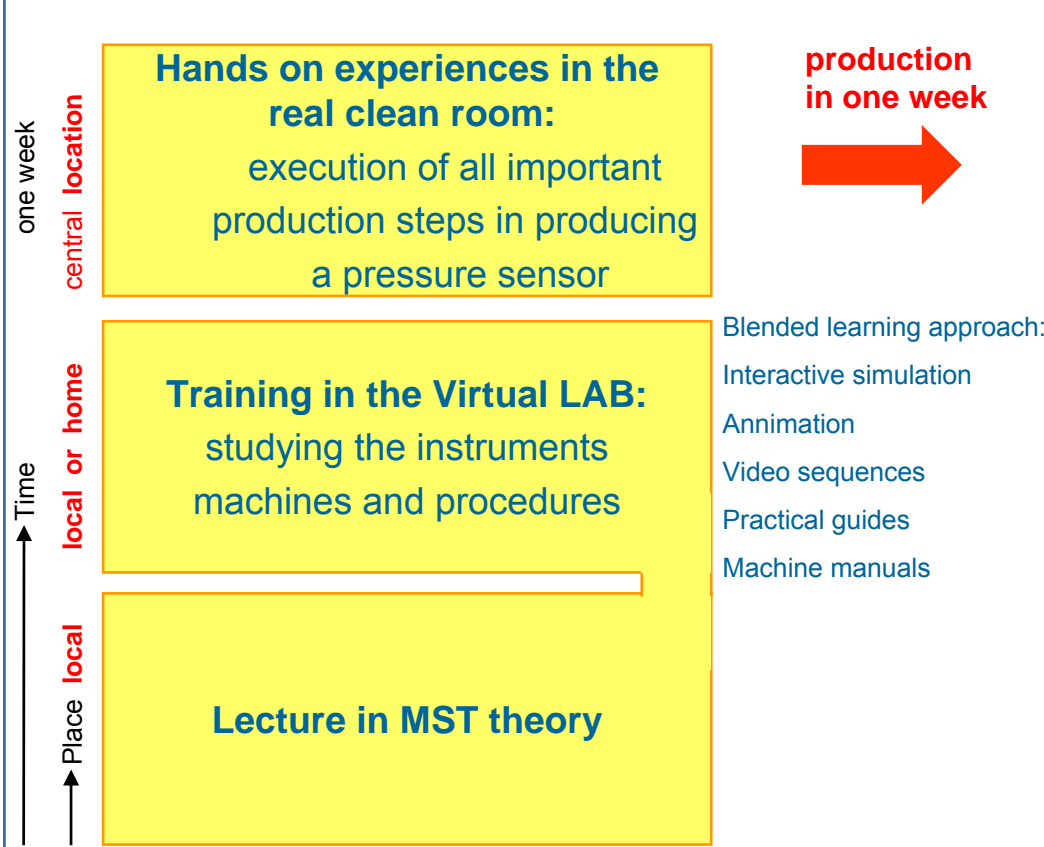


Production

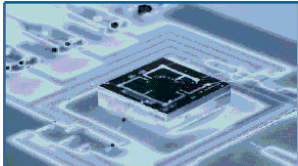




Training Approach with embedded Virtual LAB

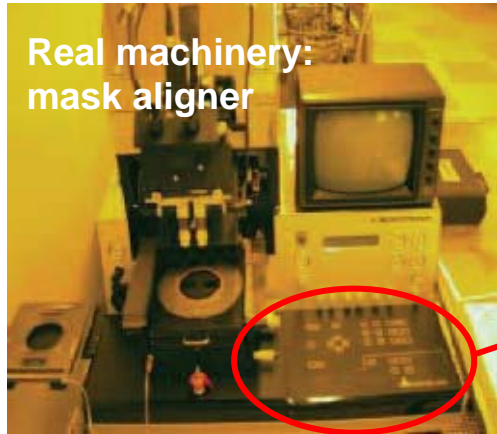


Source: University of Appl. Science Zweibrücken



Virtual LAB

Real World

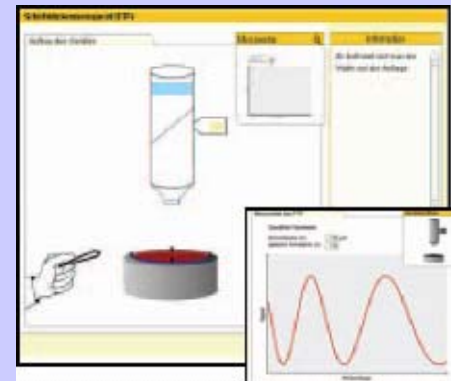


Real machinery:
mask aligner



Operating
panel

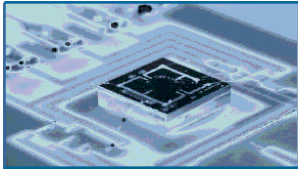
Results of a
simulated
process



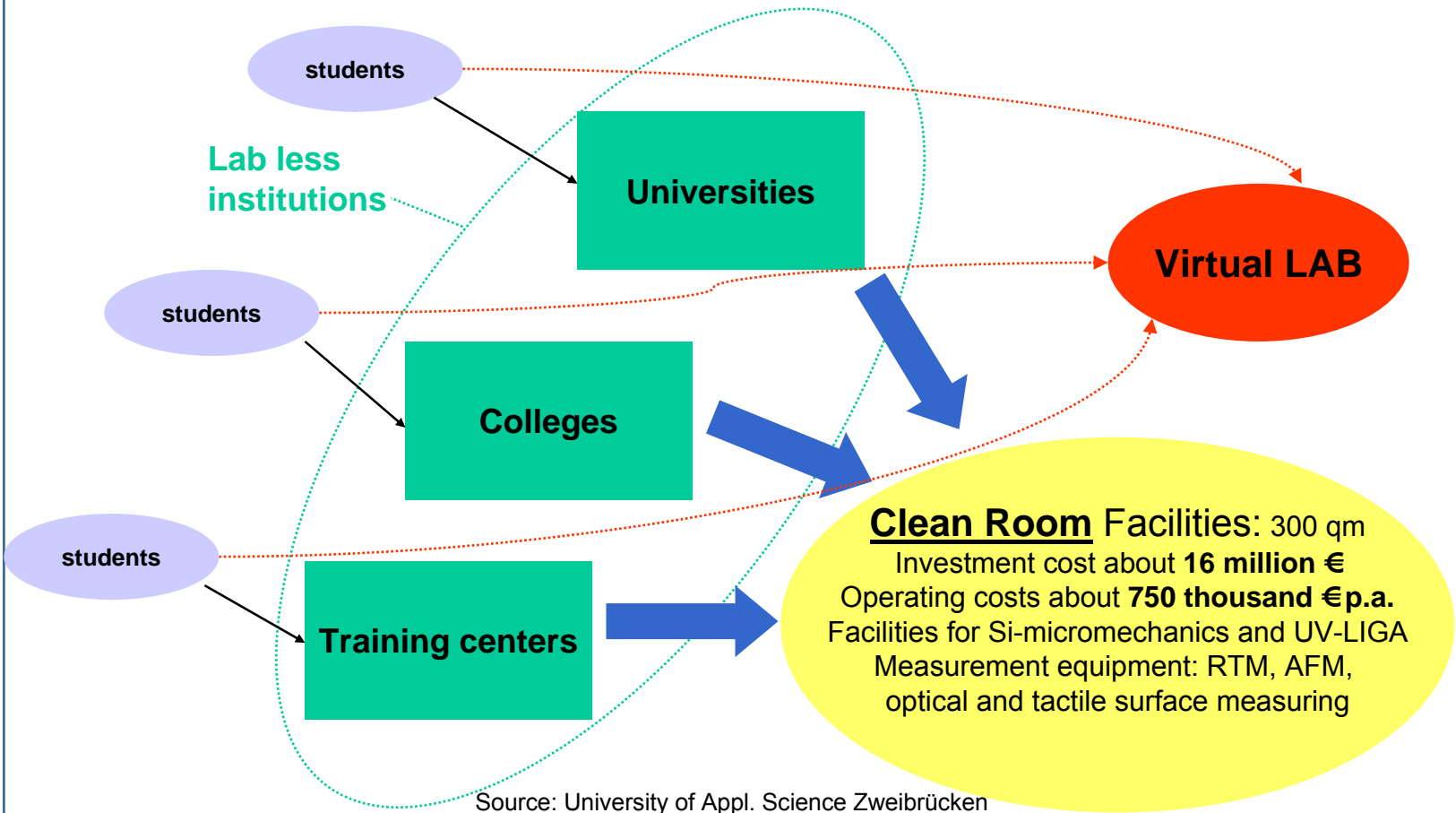
Process
animation

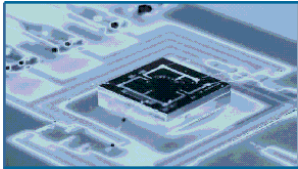
Source: University of Applied
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Virtual Process World (Screen shots)



Foundry concept in MST/MEMS





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Danke für die Aufmerksamkeit !