Leaving No Child Behind:

The Hole-in-the Wall approach to Minimally Invasive Education for mass Computer Literacy

The question of Inclusiveness

- 30 million children not enrolled in school

- About 39% of primary and 54.6% of upper primary students drop out of school

- Quality of education is poor in remote rural areas : high student-teacher ratio – national average of 46.1 with some states as high as 68 (Rajasthan)

- Growing Digital divide

- Need for solutions that address quality and inclusiveness.

Some Questions

- Objectives : Learning to use vs Using to learn
  Computer literacy or Critical literacy ?

- Educational Philosophy: Economy vs. Emancipation : is it just a vantage point?

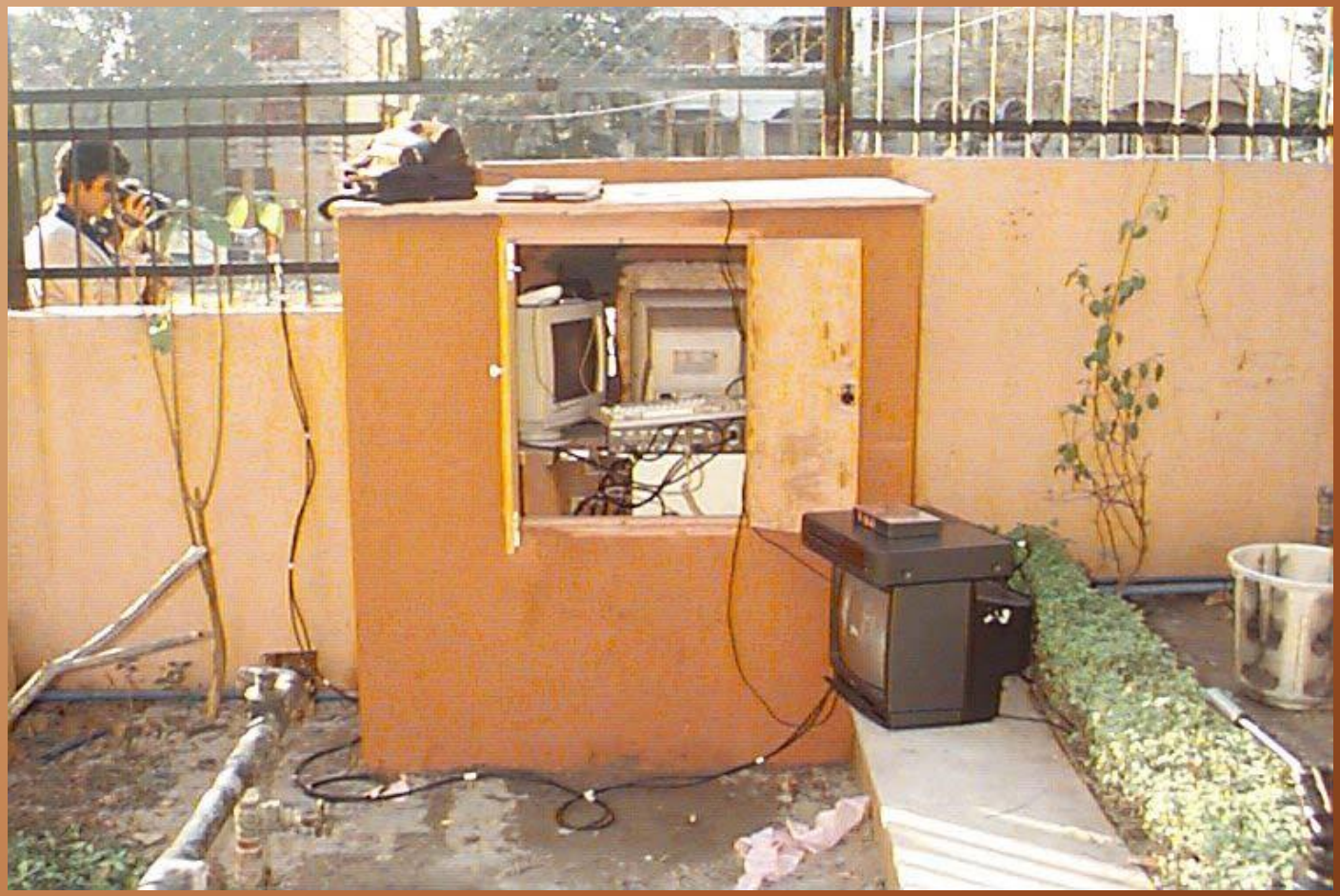
- Social, economic and contextual aspects of this debate: Is the debate socially constructed?

- Digital divide - manifestation and perspectives

Perspectives

- Theories of Education and Learning
- Diffusion of Innovation / Adoption
- Social Learning Theory
- Just computer literacy or authentic learning?
- Minimally Invasive Learning Process and Teacher Education

What's it about?



Key points

- Children in groups can self-instruct
- Vicarious Learning
- Language not a barrier (?)

- Creating vocabulary and associations in own context to describe experience
- Learning as a natural, self-organizing system : Minimally Invasive Education model

Less is More

Minimally Invasive Education *is defined as a pedagogic method that uses the learning environment to generate an adequate level of motivation to induce learning in groups of children, with minimal, or no, intervention by a teacher.*

Process of Learning in MIE

Positives and Questions

- ✓ Active exploration: Learning through play, discovery
- ✓ Memorizing procedures, Practicing
- ✓ Motivation, Enthusiasm

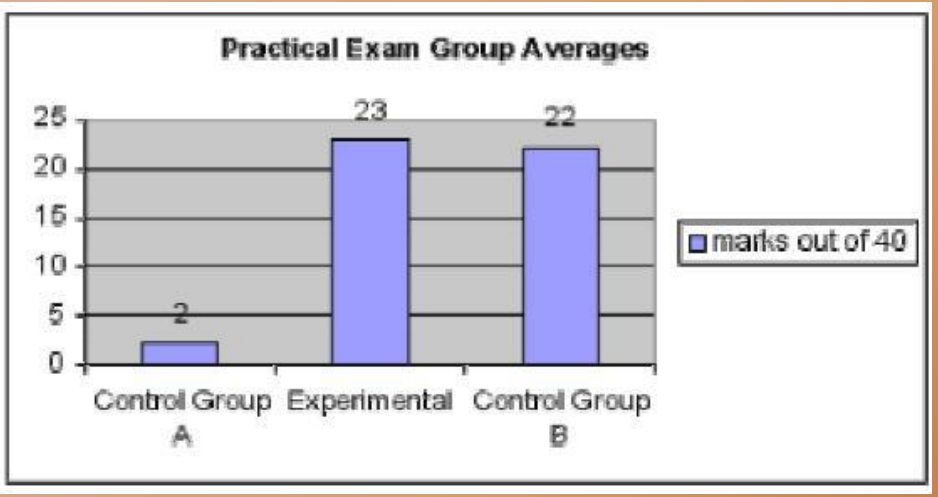
- ❖ Minimalistic expectations?
- ❖ Low end tasks – no creativity
- ❖ All accidental – no cognitive awareness
- ❖ Limited in Scope - only ‘how to’ not ‘know why’

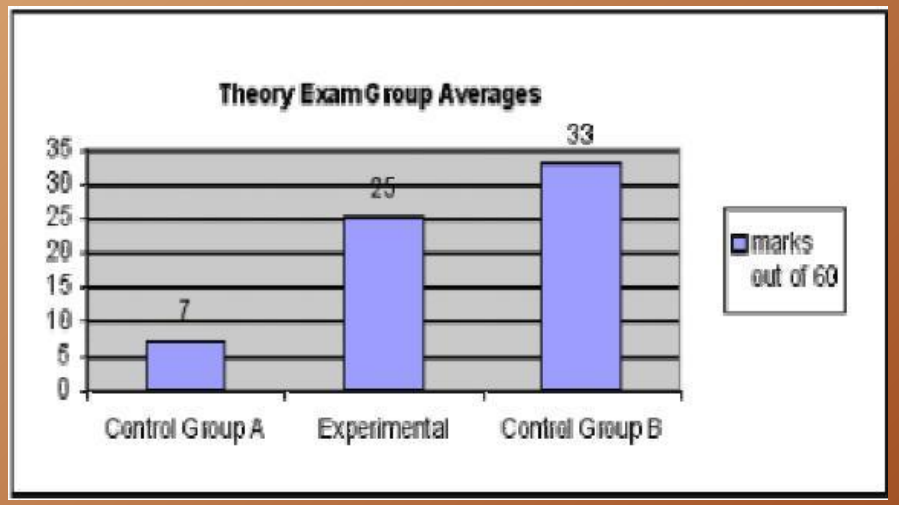
Test of Skills

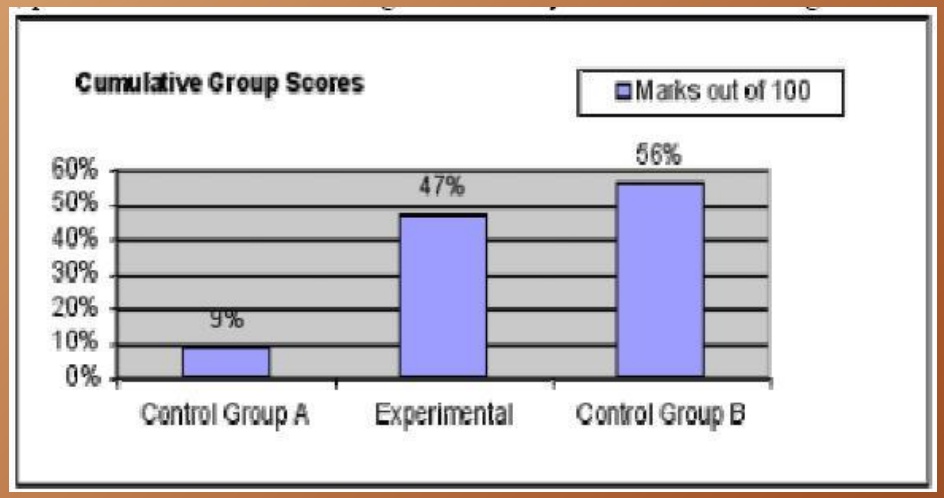
Group	Villages	Number Male Female	Age	MIE kiosk learning	Classroom computer teaching	Hours of computer handling/ exposure	English language teaching in school	Medium of instruction
Experimental Group	Kalse + Shirgao	N=30 12F+18M	12-13	Yes	No	At least 20 hours	Yes	Marathi
Control Group A	Kuvle	N=31 16F+15M	12-13	No	No	0 hours	Yes	Marathi
Control Group B	Shirgao	N=42 38F+4M	12-13	Yes	Yes	At least 20 hours	Yes	Marathi

- Computer 'science' offered as optional subject in some village schools from 8th Grade. Only few 'good students' selected for it.
- Other options : Leatherworking, Sewing, Carpentry.
- All groups administered 8th grade standard curricular test for computer skills
- 3hrs (Theory and Practical). Text book given to experimental group 1 month ahead.

From: Inamdar, P. (2004) *Australasian Journal of Educational Technology* 20(3), 337-350.







Observations of Exam process:

- Quick to relate unfamiliar terminology with experience and respond
- Quick to adapt to mouse – conceptually familiar with operations
- Approached questions as 'task' and accomplished it in alternate ways

(marked wrong for not following given procedure – problem of rote learning)

Test of Learning

- **a. *Experimental or focus groups :*** Total of 250 children from 17 locations. Icon Association Inventory (IAI) test administered at regular intervals

- **b. *Frequent users :*** *250 children from 17 locations. IAI* administered only in the ninth month (end of study). This group measured to check for bias in focus group due to test familiarity

- **c. *Control groups :*** *No* access to MIE learning stations or to any other computers.

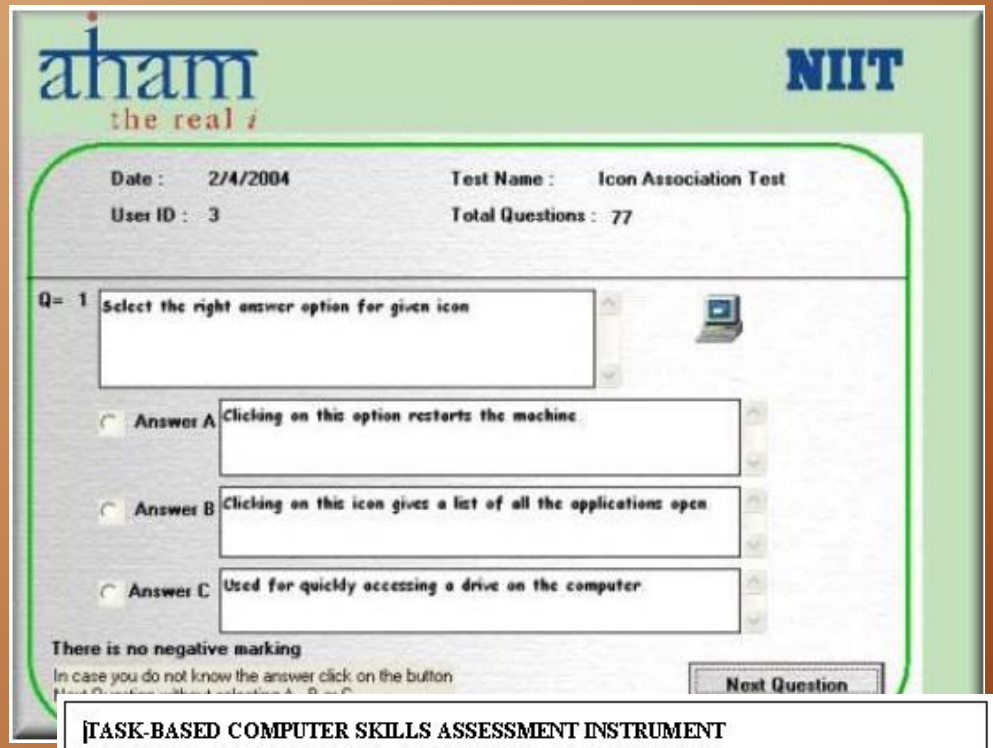
- Traditional learners from urban English-Medium School (Aged 10-13)

- Traditional Adult Learners enrolled in NIIT Diploma course (18-21 yrs)

Mitra, S. et. al (2005) Australasian Journal of Educational Technology 21(3), 407-426.

GUI Icon Association Inventory



TASK-BASED COMPUTER SKILLS ASSESSMENT INSTRUMENT

Evaluator Name _____

Participant Name _____

Note: Check [□] the blank for successfully completed tasks and place an **X** in the blank for tasks that are not completed successfully

Participant Age and Grade _____ **Date** _____

Skill Area 1: Basic Computer and Operating System Skills

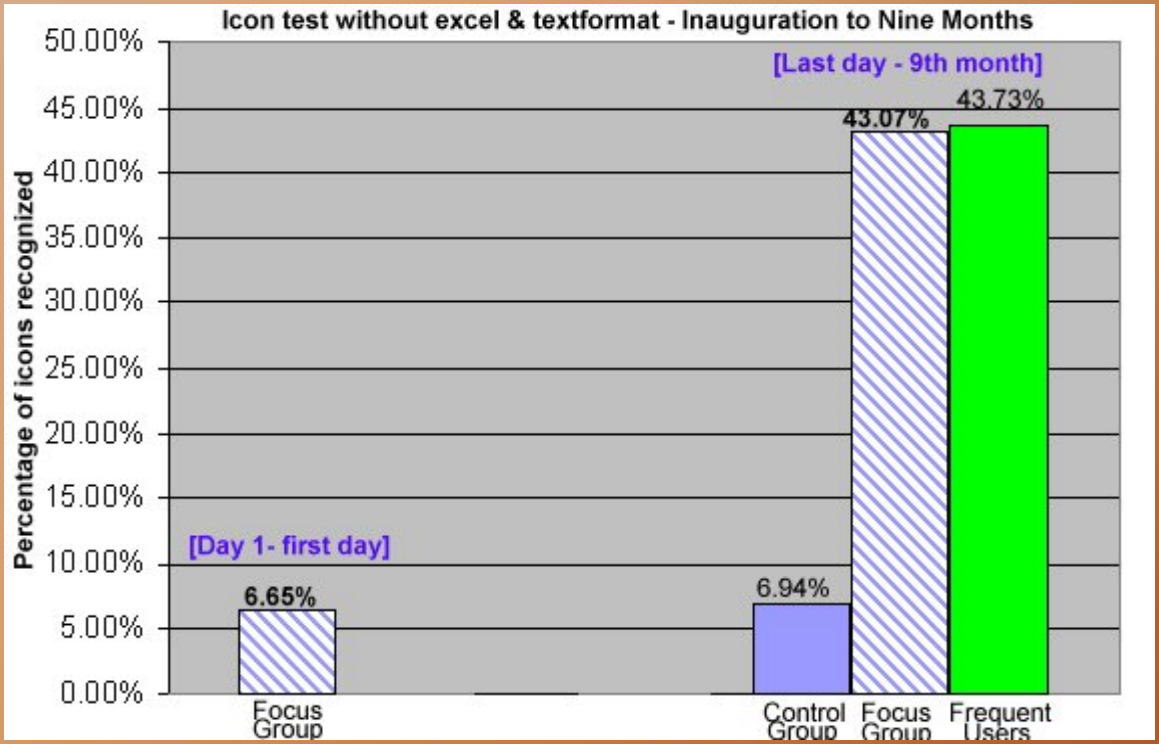
_____ Skill Set 1.1: Identifying basic components of the computer

_____ Step 1: Identify the CPU [main part of the computer]
_____ Step 2: Identify the keyboard
_____ Step 3: Identify the mouse
_____ Step 4: Identify the monitor
_____ Step 5: Identify the printer

_____ Skill Set 1.2: Turning on the computer, opening a program, using the mouse

_____ Step 1: Turn on the computer
_____ Step 2: Open the Internet Explorer program
_____ Step 3: Exit the program

Task-Based Computer Skills Assessment test from University of Missouri and Lincoln University, USA



	MIE Group	Regular School	IT Professional group
Inauguration (1st day)	6.65	10.44	11.96
3rd month (62 days)	22.12	24.01	23.73
5th month (124 days)	29.36	35.96	34.6
8th month (217 days)	38.18	Not available	49.17

c) Cost of learning (1 US$= Rs. 44, April 2005)

MIE Group	Regular School	IT Professional group
Rupee 1 per child per day, based on an estimate of an average of 200 children using each learning station. Annual cost Rs. 365/- per child	Rs. 1250/- per month per child Annual cost Rs. 15000/-	Rs. 17000/- per semester per student. Annual cost Rs. 34000/-

Frequency of usage and impact on other learning

Table 4. English ANOVA Differences

	Differences March 2002	Differences October 2004	Change of Difference from March 2002 to October 2004
Frequent – Infrequent	3.21	4.49	1.28

Neither of the differences nor the change in differences is significant

Table 5. Science ANOVA Differences

	Differences March 2002	Differences October 2004	Change of Difference from March 2002 to October 2004
Frequent – Infrequent	4.66	5.61	0.95
	Significant ($P < 0.05$)	Significant ($P < 0.05$)	Not significant

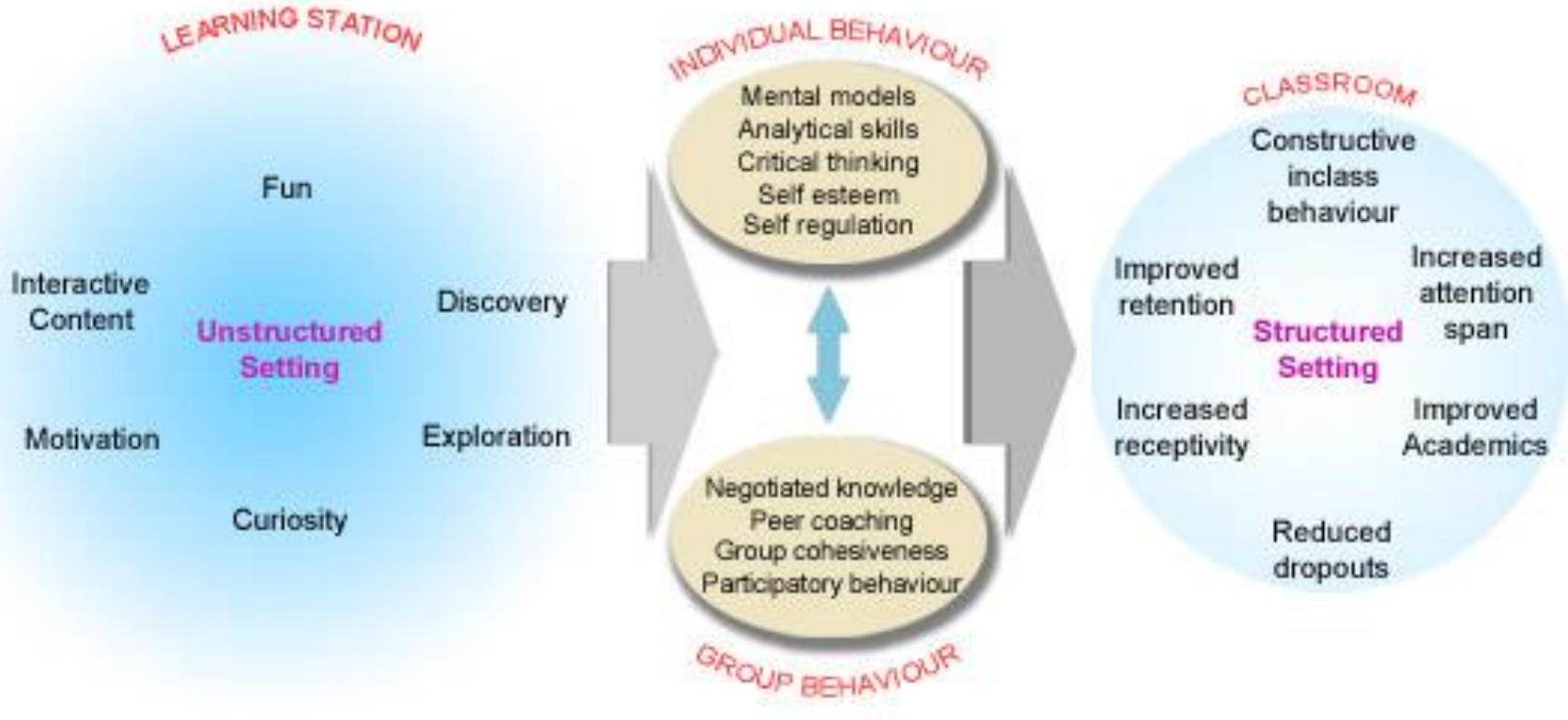
Table 6. Mathematics ANOVA Differences

	Differences March 2002	Differences October 2004	Change of Difference from March 2002 to October 2004
Frequent – Infrequent	3.39	6.56	3.16
	Not significant	Significant ($P < 0.05$)	Significant ($P < 0.05$)

Why is the difference significant only for mathematics?

Inamdar, P., & Kulkarni, A. (2007). 'Hole-In-The-Wall' Computer Kiosks Foster Mathematics Achievement - A comparative study. *Educational Technology & Society, 10 (2), 170-179.*

LEARNING DYNAMICS



Theories of Learning

Piaget : Children as builders

Papert: Builders need material to build with. Poverty of culture to provide material

Constructivism :

Pre-conception
Trial and error – reasoning and realization
Concretize, perzonalize information
Self referential and meaningful, purposeful

Collaborative Learning :

introduction of conflict to test preconception and change mental models

Theory of play

Informal, intuitive, peer-based learning in social context.

Zone of Proximal Development

Example of older students in Shivpur, more hesitant to commit mistake
Younger students have natural curiosity

Diffusion of Innovation

- What is the innovation here?
- Characteristics: Relative Advantage, Compatibility, Complexity, Trialability, Observability
- Elements of diffusion: Uncertainty, Communication channels, time, social system
- Change Agent – catalyst for change – HitW as a model for diffusion?

Social Learning Theory (Bandura 1977)

- Observational learning or modeling : central theme – Vicarious learning
  - Subprocess:
    - attention
    - retention
    - Reproduction
    - Motivation (feeling of self efficacy, acceptance, confidence, social acceptance)

Authentic task (Means and Olson, 1994)

- Tasks done for their intrinsic value – activity worthwhile in its own right
- Practice of advanced skills by all students
- Work takes place in heterogeneous, collaborative groups
- Teacher is a coach
- Work occurs over extended blocks of time

Vision for Educational Technology

An Educational Technology and Pedagogy that is:

- Digital
- Automatic
- Fault tolerant
- Minimally invasive
- Connected and
- Self Organizing

Questions Revisited

- Learning to use vs Using to learn – how different are Mitra's objectives?
- Educational Philosophy: Economy vs. Emancipation : is it just a vantage point?
- Social, economic and contextual aspects of this debate: Is the debate socially constructed?
- Digital divide - manifestation and perspectives

- How different are Mitra's objectives for computer literacy from what you experience here?
- How differently can we view the digital divide?
- **Minimally Invasive Education** : Is this true for all kinds of learning and the entire learning process?
- Can you think of how to use it in your subject area?
- How can we use it in Teacher Ed?