Multiple Inputs for Shared Computer Use

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ICTs & Ed in the developing world

- No clear empirical consensus on whether ICTs benefit
  - Math gains / contradictions
  - Benefits mostly supplemental
  - Drill gains
- TCO rarely part of calculations
- Development education experts rarely ICT experts
- Several operational factors:
  - Admin uptake
  - Curricular mapping
  - Constructivist learning?

Means of deploying ICTs

	Individual	Group
Portable Devices	Laptops	Simputer
Fixed Devices	PCs, Refurbs	PCs, Thin Client, Refurbs

ICT & Education: A few things to work with

- Ideally involving teachers, but practically, without
- Most usage shared
- Most software built for single user
- Sharing impacts collaboration and engagement

How do children share a computer?

Can we find socio-economic patterns?

- Strong suggestion that seating patterns reinforce social and classroom inequalities
- Using the ANOVA test for Statistical Significance we find:
  - The correlation between the position occupied by the student during the computer class and
    - the **student's family's economic position** is statistically significant to over 95.1%
    - and to a **student's performance in class** is statistically significant to over 99.8%

	Seating Position (n=102)				
	L2	L1	T	R1	R2
Class Performance	1.50	2.00	2.68	1.95	1.50
Economic Affluence	2.00	2.36	2.68	2.24	1.00

Computer Control Patterns

- Narrative modules less popular
- Center scrolls w/o much collaboration
  – Eye contact with screen poor
  – Sense of 'computer pride' hurts scroll pace

- Academically:
  - Choice of CAL module usually on center user
  - Over time, the mouse controller gains automatic default position in usage

Non-technical intervention

CASE 1
ORIGINAL SEATING

COMPUTER SCREEN

L1 C R1 R2

CASE 2
REARRANGED SEATING

COMPUTER SCREEN

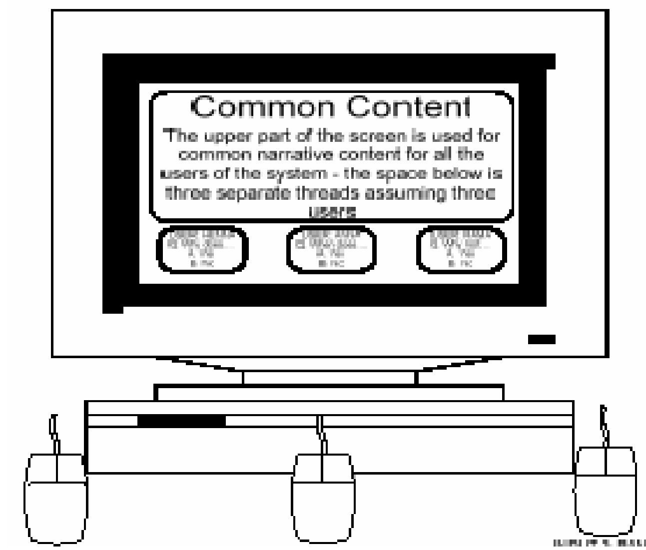
R1 R2 L1 C

CASE 2: GROUP GETS “SMALLER” AS FORMER MOUSE CONTROLLERS MOVE CLOSER TO COMPUTER SCREEN

Conceptual design intervention

Seat shuffle found effective only in short run, thus we concluded that two factors were critical to make CAL more effective:

1. Modular design for short seating length
2. Multi-user system design
   - Pedagogical Design – needing children to talk
   - Physical Design – shared input/interaction



Multiple Input V1: Race Mode

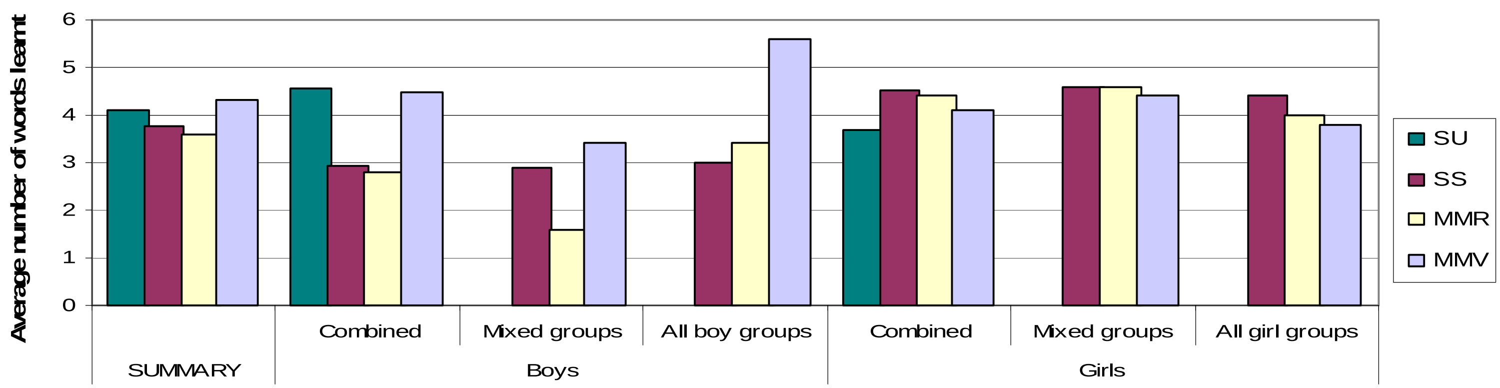
Image: Microsoft Research India

Multiple Input V2: Collaborative Clicking

- **MSR-India wrote driver and application for MultiPoint**
- **Finding: Children learn basic retention tasks better in shared/collaborative scenarios**

	Words Learnt	Engagement	Decision-making	Response error	Conflict (Boys)	Conflict (Girls)	Intra-group Competitiveness	Dominance by a child
SU	4.11	High, tails off	Individual	Low	n/a	n/a	n/a	n/a
SS	3.77	Low	Collaborative	Very Low	High	Low	Medium	Varied
MMR	3.6	Very High	Individual	Med-High	Low	Low	Very High	None
MMV	4.3	High	Collaborative	Very Low	Medium	Low	Low	Varied

Table 1: Findings Matrix for qualitative observations from experiments E1 and E2, N=238 ('Words Learnt' from E2)



Multiple Input V3: Split Screens

- *Based on finding that both collaboration and competition are needed*

- Split screen
- Playing in teams
- Turn taking
- Collaboration
- Competition
- Scoring

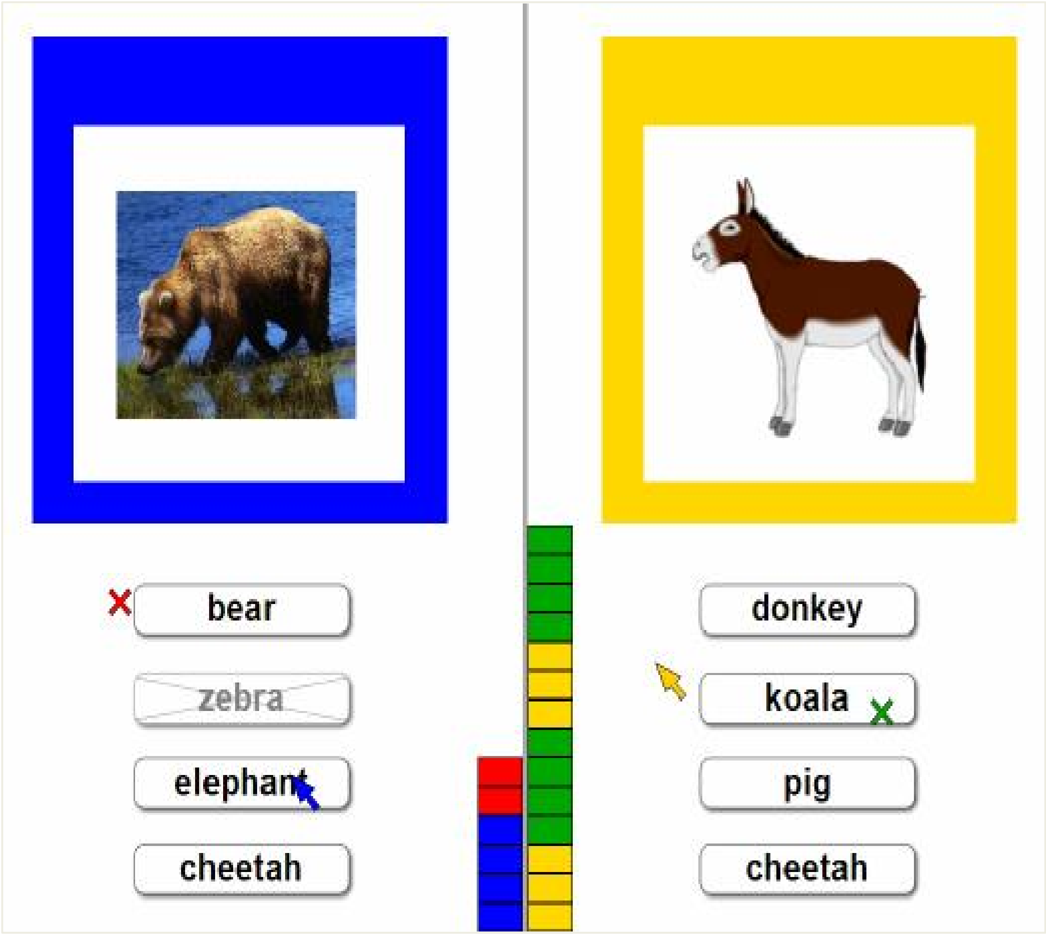


Image: Owen Otto (Otto et al. CSCW 2009)

Multiple Input V4: Multiple Keypads & Split Screens

- MultiMath
- Multiple Numeric Keypads
- Split screen
- Competition

Image: Clint Tseng (Garg et al. ICTD 2009)

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Product Mode

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  http://www.microsoft.com/unlimitedpotential/TransformingEducation/MultiPoint.mspx

Thanks! email:joyojeet@washington.edu