The Effect of a Simcalc Connected Classroom on Students’ Algebraic Thinking

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Aims of the presentation

• Introduce the exciting new idea of Classroom Connectivity

• Discuss methods and methodological issues in measuring the effect of technological innovations
Dynamical Mathematics
(in the form of SimCalc MathWorlds) + Classroom Connectivity (many forms)
Main Aims of Project

- Connecting student constructions in MathWorlds across computers to support *participatory aggregation*, “mathematical performances,” and other uniquely engaging activities

- Leverage teacher pedagogical power

- Leverage classroom social structures to tap into student personal identity & interests
Context

- After school algebra enrichment program
- Unique population 7th - 9th graders
- Core algebra ideas
- Pre/post MCAS instruments and classroom observation
Java MathWorlds

• Ability to visually and algebraically edit functions
• Simulation
• Hot link position and velocity graphs
• Collect student work #onstructions and send activities to 83 plus version of MathWorlds
• Configure activities for CMW
Example of a CC Activity

- 5 groups of 3 5 students
- Count off # within the group
- Actor A #target runs at 2 feet/sec for 6 seconds
  $Y = 2X$
- Construct a motion algebraically to end the race in a tie
- Aggregate and compare
Measuring the effect

- Pre Post for whole test between groups using paired t test

- Pre Post item by item using log odds ratios and confidence intervals

- Effect #Cohen’s d and Hake’s Gain

- Link specific item gain to observation data via data mining and iterative video analysis
Overall results

- Pre Post scores for each group +d
Item Analysis

- Comment on Log Odds and CI
Example

- OR +CI
- Graphic of Circumference
- Face validity
Data mining: Interactive Video Analysis

- note classroom participation
- aesthetic form motivates students
- group collaboration
- rationalising the individual self within group gestalt
Pedagogically, What are we Doing?

- We enable the teacher to render an individual’s mathematical activity public in a shared display.
- We interlink mathematical structures and classroom social structures #both designed and naturally occurring to create new forms of learning, new activity structures.
- We intensify, focus & manage student attention.
- We promote the infusion of personal & social identity in students’ mathematical constructions.
• Classroom management of students is changing which leads to introducing traditional curriculum in different ways

• What is given & what is hidden is tightly manipulable to serve a wide range of pedagogical & curricular aims

• Attention can be explicitly managed by the teacher by showing/hiding/grouping students’ constructions
Theoretical insights

- Personal identity is projected into the public object
- Issues of privacy
- Embodying mathematical parametric variation
- Classroom is infused with affect & social authenticity
- Learning is linked to social construction and public examination (Situated Cognition, Peripheral Participation)
- 1st/2nd order symbolism (Vygotsky) - physical/cybernetic actions are now “projected” - a new role for symbolic meaning making in mathematics
Extending connectivity

- use of 83+ and connectivity
- one year study of college freshmen
- 48 item pre post test
- observed similar strong results
Calculator MW

| Hot linked Position and Velocity Graphs | Algebraically defined functions |
Integrating CMW and JMW
Navigator and MathWorlds Integrated: Video
Thank You

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