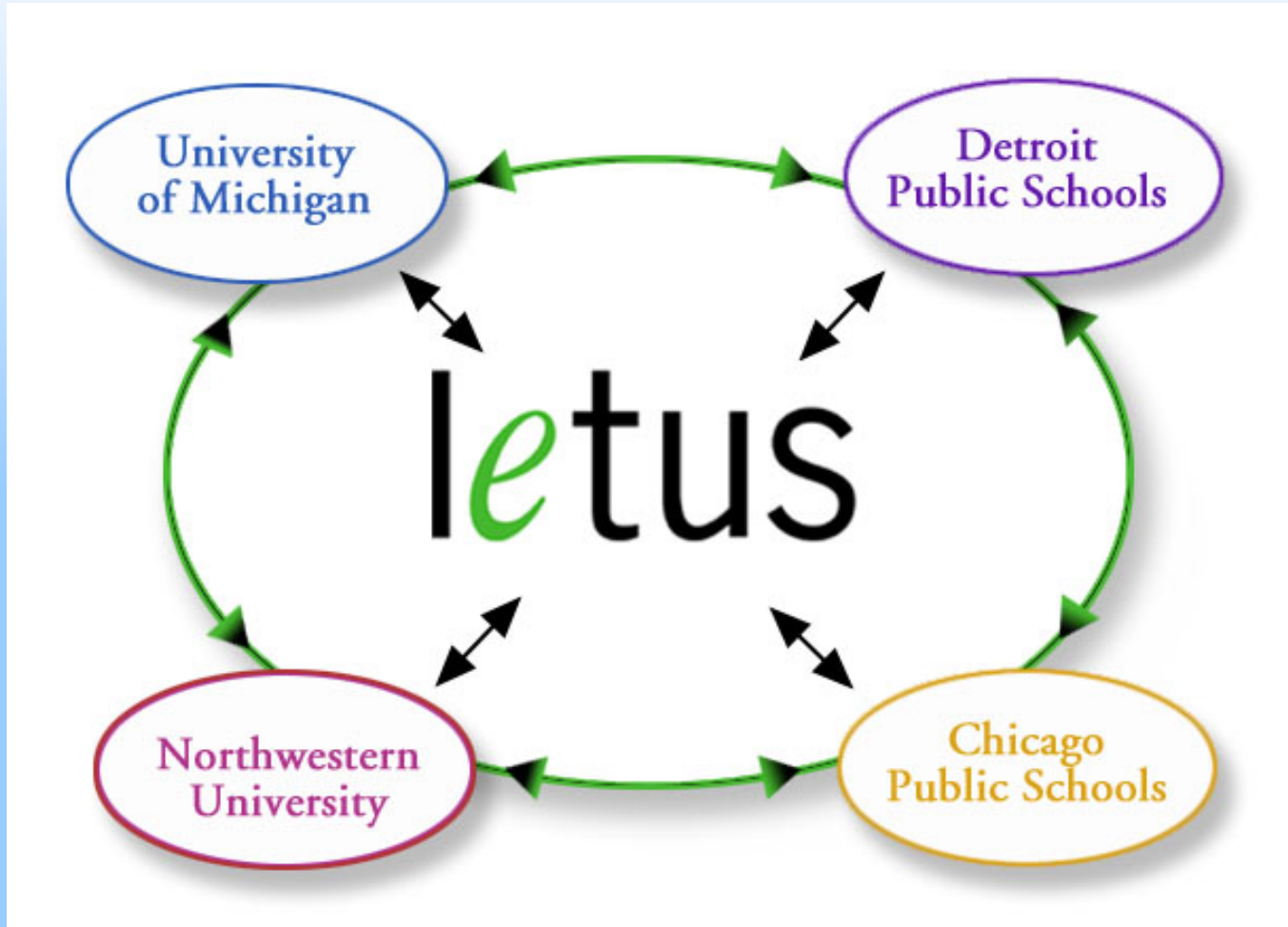


Systemic Reform Retrospective: Successes, Failures, Challenges

Ronald W. Marx
Dean of Education
University of Arizona
Tucson, Arizona

- My experience with systemic reform in middle school science circa 1994-2003
 - Focus on the Center for Learning Technologies in Urban Schools, 1997-2002
 - Describe effort, present some findings
- More recent experience
 - Policy participant for Arizona Governor Janet Napolitano
 - Education dean trying to re-invent a college in a challenging climate

LETUS



Detroit Public Schools

- Almost all students are minority, poor
- Teachers
 - High turnover and mobility
 - Hard to recruit and retain
 - Teaching out of subject
- Highly unionized
- Highly centralized
- Politically contested

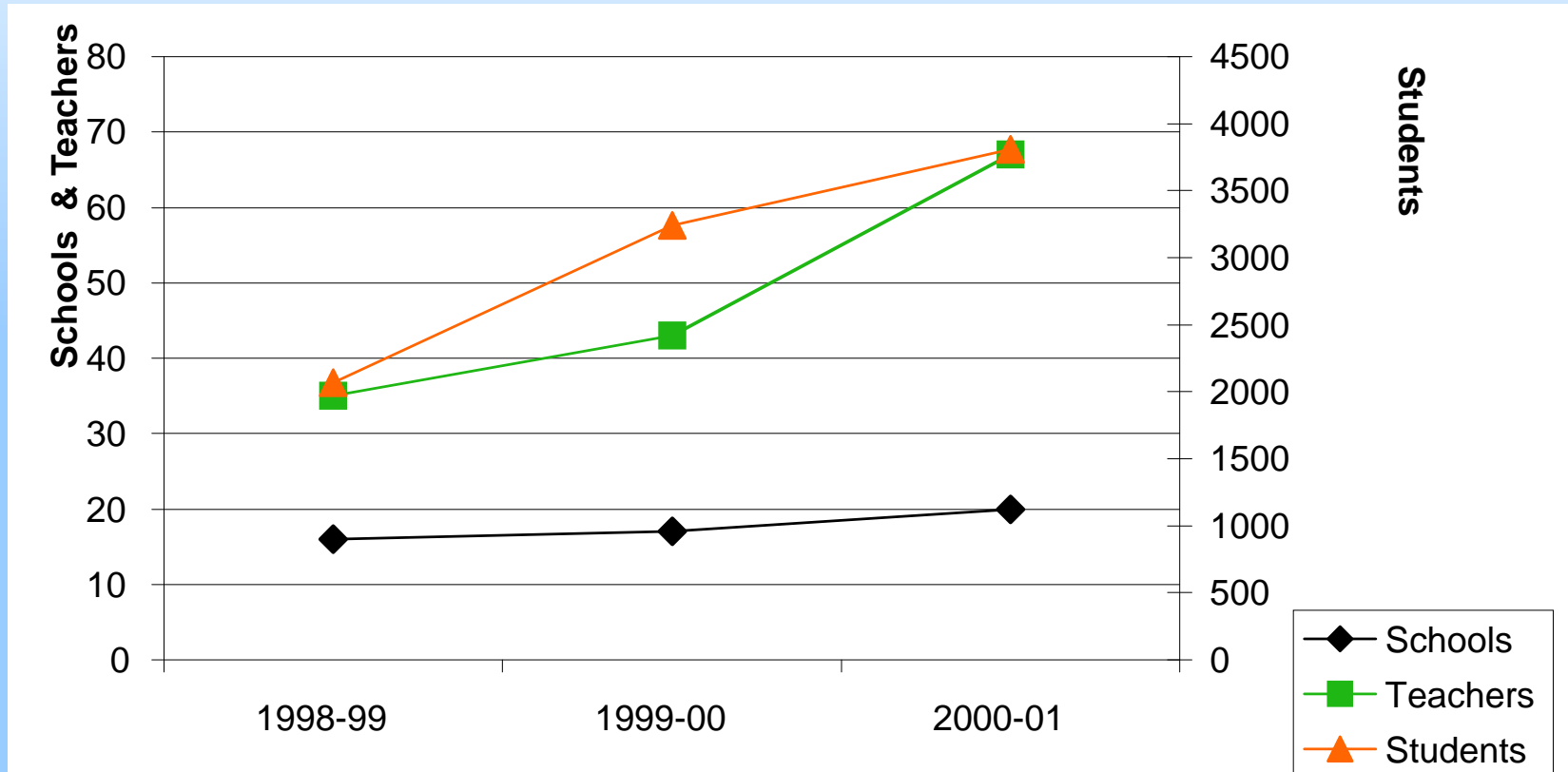
Innovations must be....

- Usable-can be used to accomplish work
- Scalable-spread to other teachers, schools, districts
- Sustainable-take root in context beyond initial introduction

Our Innovation

- A systemic reform program focusing on inquiry-based science with embedded learning technologies for middle school
- Curriculum
- Technology
- Professional development

Scale of Work



Necessary Conditions

- Organizational culture
 - Norms, routines, practices
 - Beliefs, understanding of reform
- Management and policy
 - Alignment
 - Curriculum & assessment
 - Coordination
 - Resource allocation
 - Curriculum & technology organizations
 - Politics
- Capability
 - Expertise

Design of Curriculum Materials

- Collaboratively developed with teams of teachers, scientists, curriculum specialists, educational researchers
- Based on design principles (Singer et al., 2000)

Design Principle	Instructional Component
Context	Driving question Anchoring event
Standards based	AAAS Benchmarks NRC National Standards
Inquiry	Asking questions Collect & analyze data
Collaboration	Small group design work Think, pair, share
Learning tools	Data collection Modeling
Artifacts	Scientific models Lab reports
Scaffolds	Teaching strategies Instructional materials

How Can Good Friends Make You Sick?
Communicable Diseases - 7th/8th

Why Do I Need to Wear A Bicycle Helmet?
Force and motion - 8th

What Affects the Quality of Air in My Community?
Basic Chemistry Principles - 7th

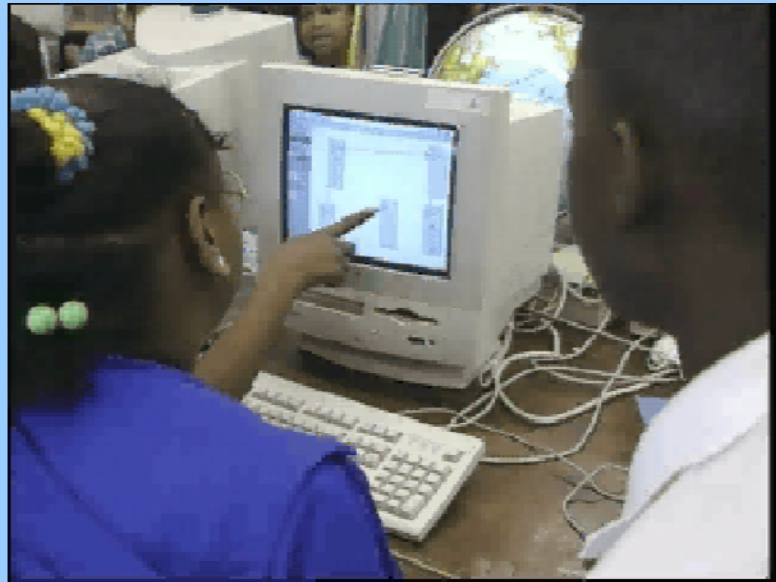
What is the Quality of Water in Our River?
Water Ecology - 7th

How Do Machines Help Me Build Big Things?
Mechanical advantage - 6th



Technology

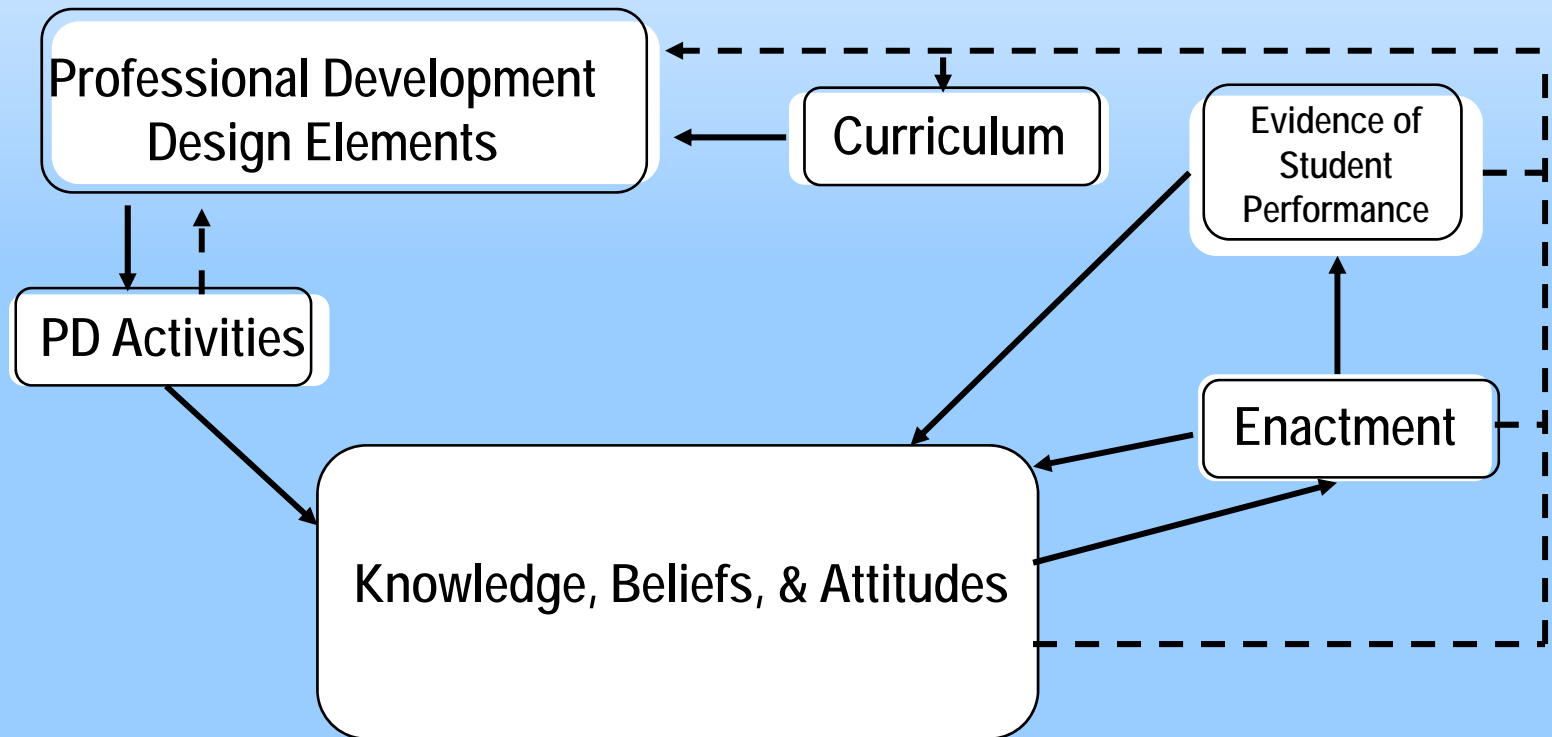
- Students are supported by **technology** as they collect and analyze data and build models of scientific phenomena
 - **Probes** are used in collecting real-time data for physical and chemical factors that affect water quality
 - **Model-It**, a dynamic modeling tool, allows students to build models of how different chemical and physical factors affect their water quality.



Design of Teacher Professional Development

- Content
 - Knowledge & skill
- Strategies
 - Modeling, examining student work, planning
- Sites
 - Classroom visits, summer workshops, after-school meetings
- Media
 - Face-to-face, video, internet

Teacher Learning Model



Enacting Professional Development

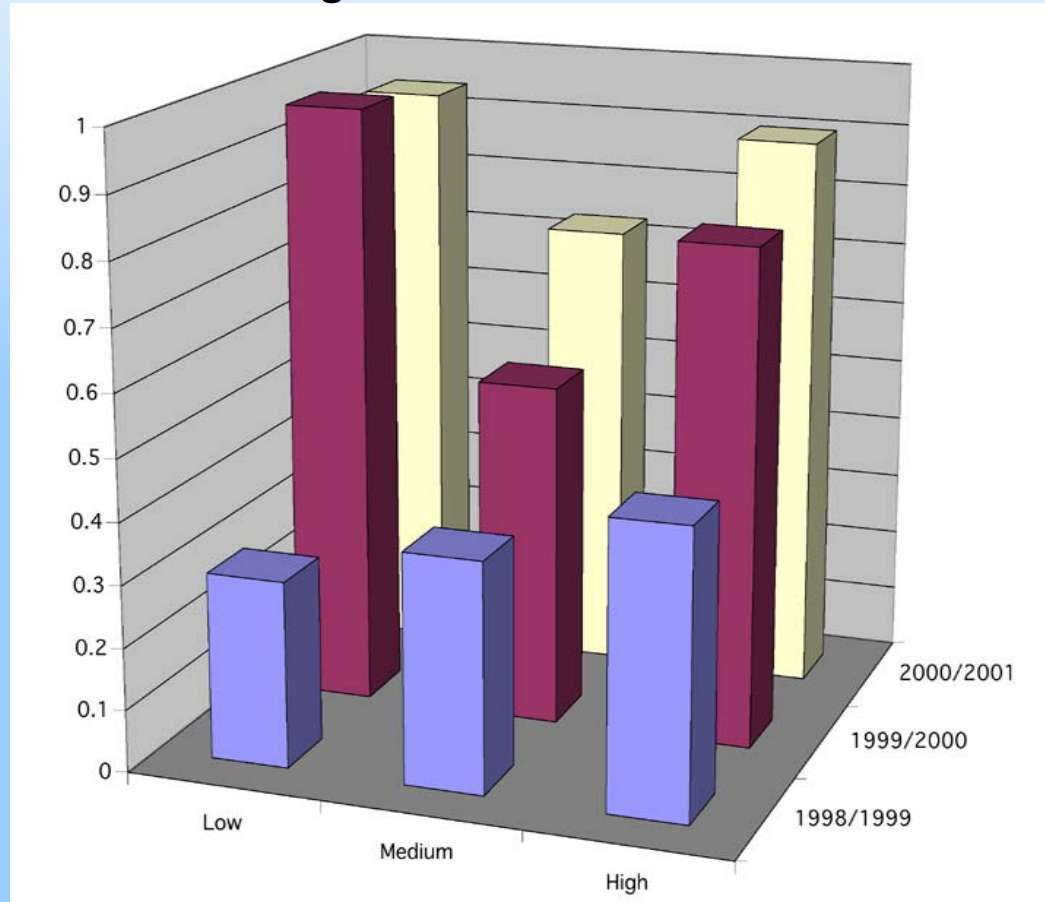
- Recruiting & engaging schools & teachers
- Summer institutes
- Monthly meetings
- Classroom support
- On-line support
- Developing cadre of teacher leaders

What happens when all of these elements are coordinated?

- Assessment approach from proximal to distal
 - Curriculum specific assessments
 - High-stakes state assessments
 - Both linked closely to state standards

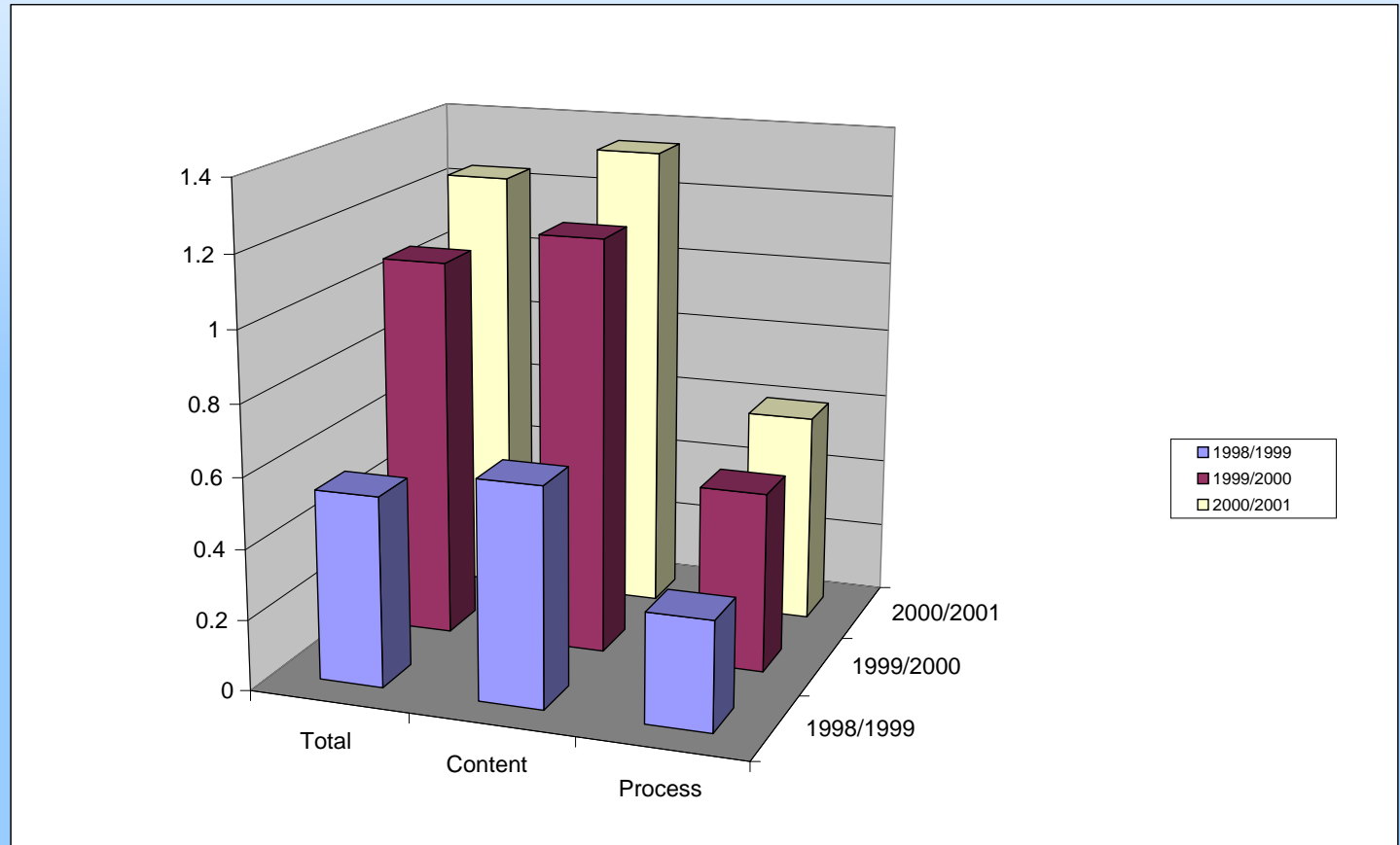
Tests Results/Cognitive Level

Weighted Average Effect Sizes for Low, Medium and High items.



Test Results/Content & Process

Weighted Average Effect Sizes for Total, Content and Process Scores.



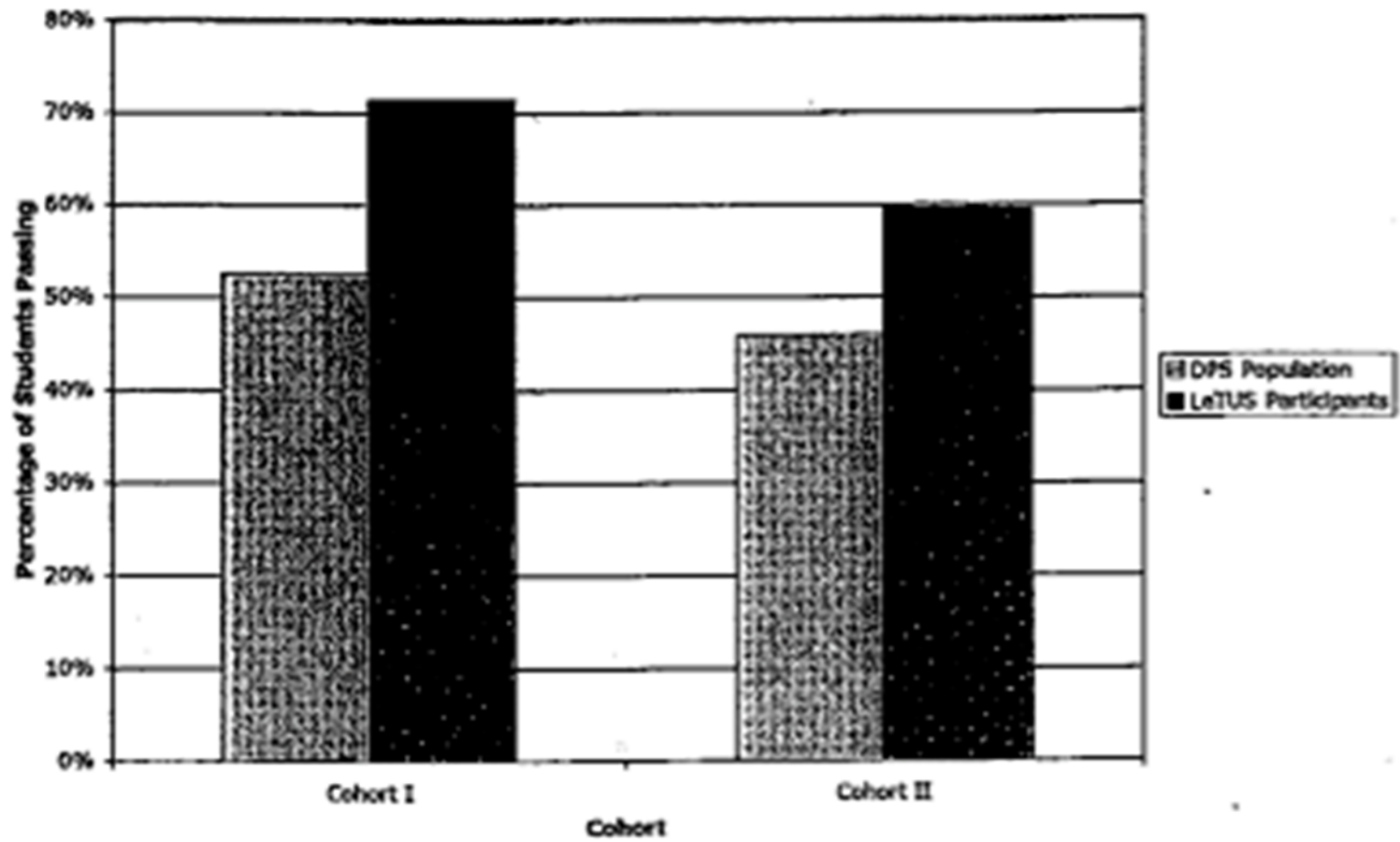


Figure 1. Science MEAP passing rates by LeTUS Participation.

What We Did Well

- Curriculum
 - Responsive to teacher challenges
 - Cycles of improvement
- Technology
 - Linked to curriculum
- Professional development
 - Long term
 - Instructional focus
 - Addressed student thinking & learning
- Research

Shortcomings

- Navigating local politics
- Engaging school leadership
- Strategies for engaging schools
- Creating & sustaining new institutional roles

Starting New Projects

- All parties must feel ownership
- Long term commitment is key
 - Trust
 - Tenacity
- Focus must be maintained
 - Unlimited possible issues
- Expertise needs to be marshaled
 - Interdisciplinary research
 - Professional staff

Projects in Context

- Policy layers
 - National
 - State
 - Local
- Policy uncertainty in democracies
 - What politicians do
 - What evidence is used for decision making?
 - Half life of policy

Projects Involving Higher Education

- Tension between “service” and “research”
- Complexity is difficult for graduate students
- Navigating different institutional
 - Missions
 - Cultures
 - Work styles & calendars