

Professional Development: What does research say?

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University of California, Berkeley

Workshop on Enhancing Professional
Development for Teachers: Potential Uses
of Information Technology
National Academy of Science
February 8-9, Irvine CA



TELS Partners

Arizona State U.

Doug Clark

The Concord Consortium

Bob Tinker, Paul Horwitz, Ken Bell

Mills College

Jane Bowyer

Christopher Newport U.

S. Raj Chaudhury

North Carolina Central U.

Tun Nyein, Gail Hollowell

Penn State

Chris Hoadley

Technion - Israel Institute
of Technology

Yael Kali

UC, Berkeley

Marcia Linn

Ontario Institute for
Studies in Education

Jim Slotta



TELS Professional Development Folks

Freda Husic

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Doug Kirkpatrick

Keisha Varma

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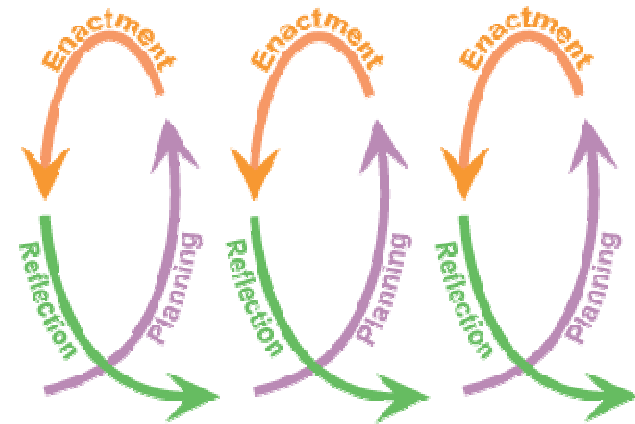
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Jon Breitbart

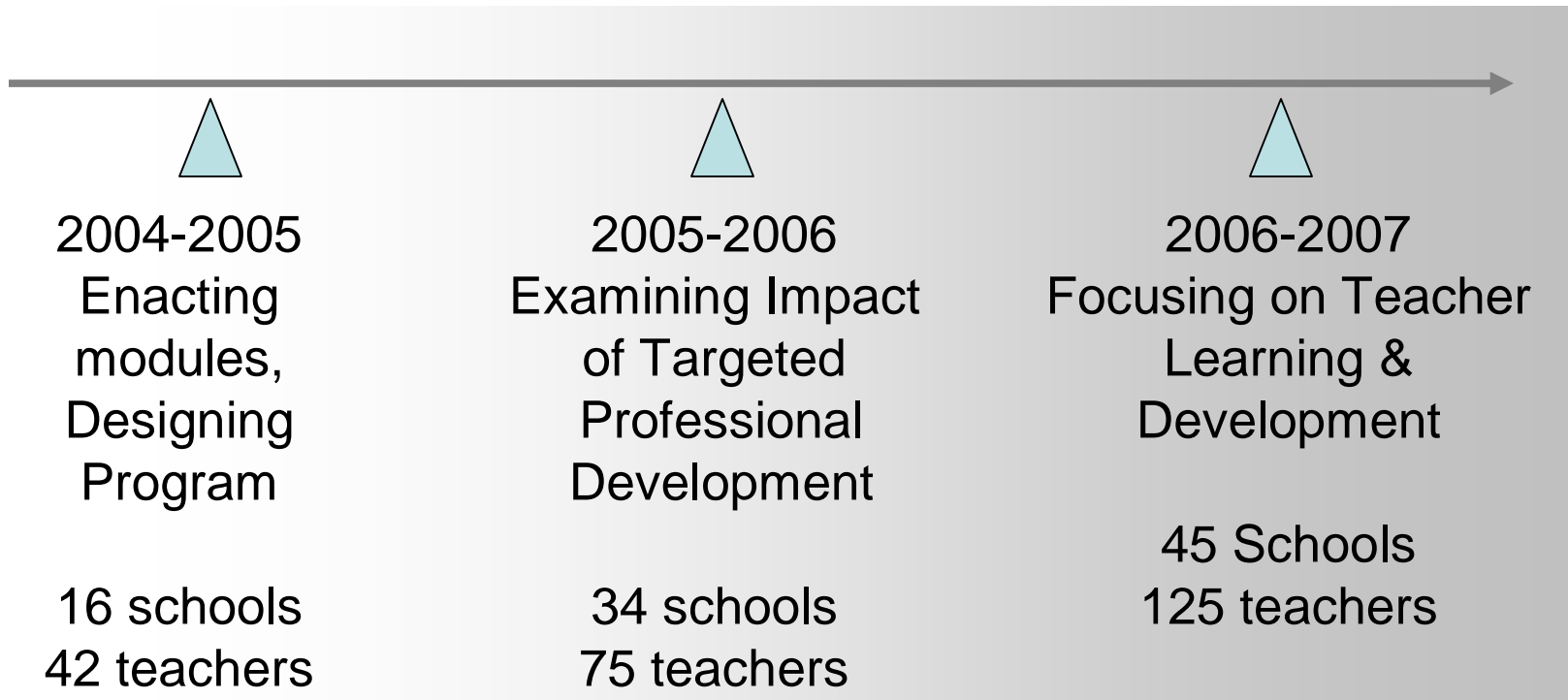


Targeted Professional Development

- Essential preparation just before enactment
- Targeted support during enactment
- Teacher initiated professional development



Research Timeline

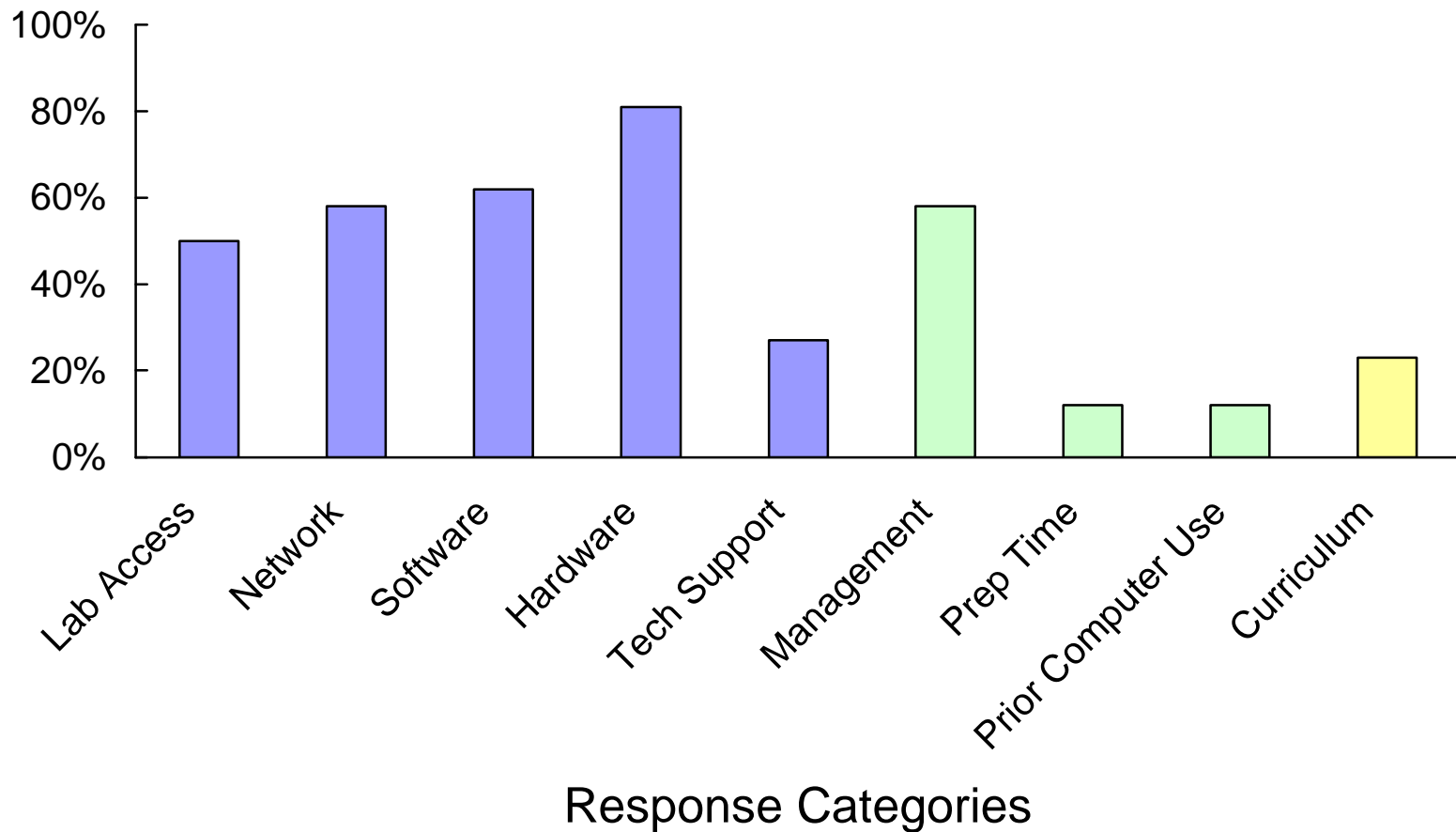


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TELS
TECHNOLOGY ENHANCED
LEARNING IN SCIENCE

Teacher Reported Obstacles



Teacher quote about support:

““I thought it was excellent. And when I began it, (TELS mentors) were here which was great. I liked that they had come before hand to run through it with us, and if we had questions we knew who to contact.”

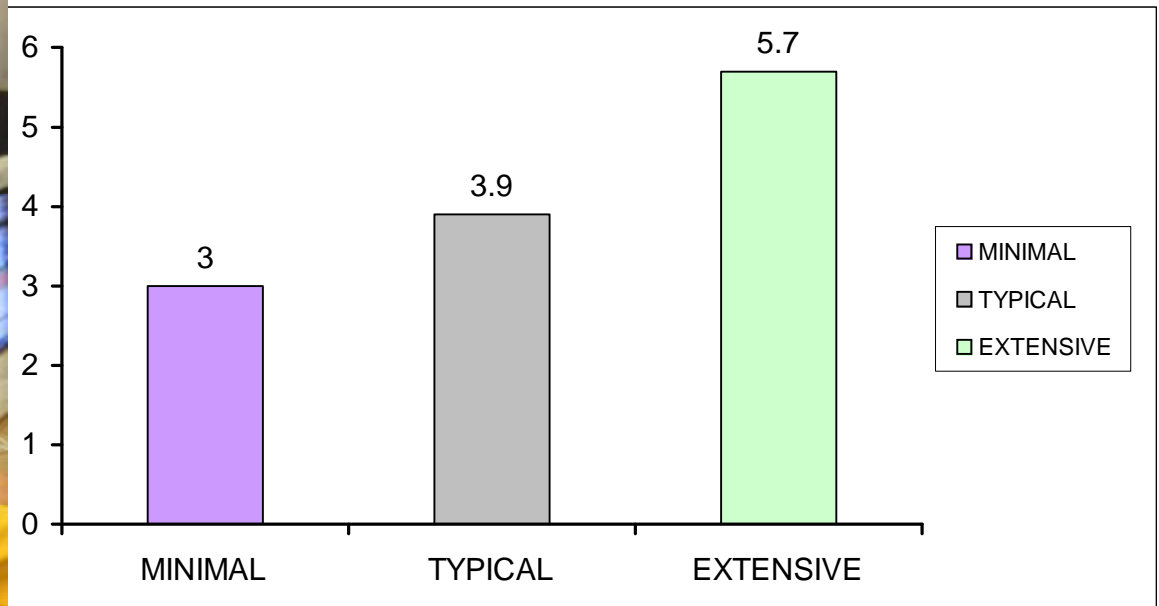


Levels of Support Trajectory

2004-05 Teachers			
	Minimal	Typical	Extensive
Description	One or two days of classroom support from researchers	3 to 4 days of classroom support	5 to 7 days of classroom support
Percent of Teachers	12%	50%	38%

2005-06 Teachers			
	Minimal	Typical	Extensive
Description	One or two days of classroom support from researchers	3 to 4 days of classroom support	5 to 7 days of classroom support
Percent of Teachers	38%	54%	7%

Relationship Between Obstacles & Support



Teacher Professional Development Project

Technology Enhanced Learning in Science

Michelle Williams
Michigan State Univ.



On-line Mentoring

TELS Pre-Workshop: Getting Started with WISE

Step 1: Students' Science Ideas

What ideas do your students hold about the science content in the WISE project you are planning to implement?

Vicki: They are unfamiliar with balancing equations so this will be completely new to them.
(Referring to the Chemistry project)

Bernard: Students have worked with atoms and states of matter. Students know very little about the project, "Forces and Motion." (Referring to the Hanging with Friends project)



On-line Checklist

Step 3: A quick check list

Have you checked to make sure that each of your computers meet the technical requirements specified in the WISE PET?

1. Yes (Vicki)
2. Yes (Bernard)

Have you explored the Management feature in the in the WISE Teacher's PET, and obtained your student registration code? When your students first register for WISE, they will use this code to make sure their WISE accounts are attached to yours.

- Yes (Vicki)
- Yes (Bernard)

Have you paired your students in groups of two?

- No (Vicki)
- No (Bernard)

On Site Reflection

TELS Onsite Workshop Evaluation:

Step1: Reflections

What teaching strategies do you think you will use when implementing the TELS curriculum unit?

Vicki: I will probably use a lot of one on one instruction during this activity. This will be in addition to a short explanation and writing examples on the board.

Bernard: Students will work in groups of 2 in the large computer lab the first day. During the days that the NC Computer Competency will be given to the 8th graders, my class will use the Foreign Language Lab for TELS. All students will complete the Pretest prior to going into the lab.

What is one key piece of evidence in the curriculum unit that you will use to decide if your students are learning? Please feel free to list additional evidence as well.

Vicki: Can they balance an equation correctly that involves combustion reactions.

Bernard: The key piece of evidence used will be the city map project, the motion tests for the runner, bus, and car, and the graphing simulating.



TELS Professional Development for Principals

Sample Publications:

Jane Bowyer

Gerard, L., Bowyer, J., Harrison, C., & Lee, H.-S. (2006, April). Leading Technology-Enhanced Curricula Reform in Science: Designing a Professional Development Model for Principals. Paper presented at the Annual meeting of the American Educational Research Association, San Francisco, CA.

Libby Gerard

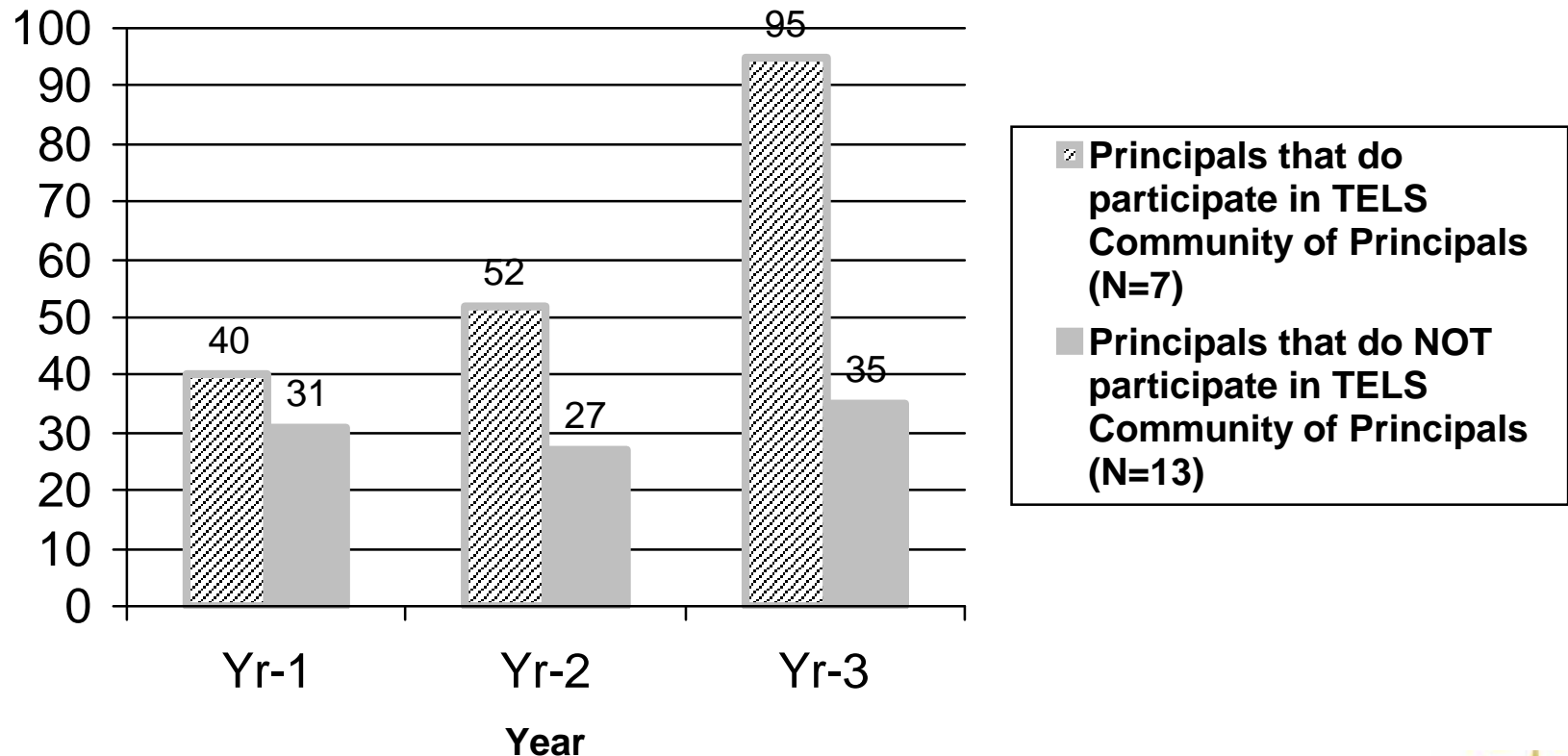
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Gerard, E., Bowyer, J. & Linn, M. (2006, April) Engaging principals as learners in technology-enhanced science curricular reform: a case study. Proceedings of the National Association of Research in Science Teaching Conference 2006. San Francisco, California.



Impact of Community of Principals' Professional Development Model on School-wide Scaling of TELS

Figure 1. TELS Community of Principals' Impact on Scaling TELS Curriculum



* = Range in the number of science teachers in the science department = 27. Median = 8.



Developing School Leaders

Mentored and On-line Development of Educational Leaders in Science (MODELS)



Alton Lee, Doug Kirkpatrick, Michele Spitulnik, Tara Higgins,
Stephanie Corliss



Spitulnik, M. W. & Linn, M. C. (in preparation). Professional Development and Teachers' Curriculum Customizations: Supporting Science in Diverse Middle Schools.

Support Teachers' Use of Evidence

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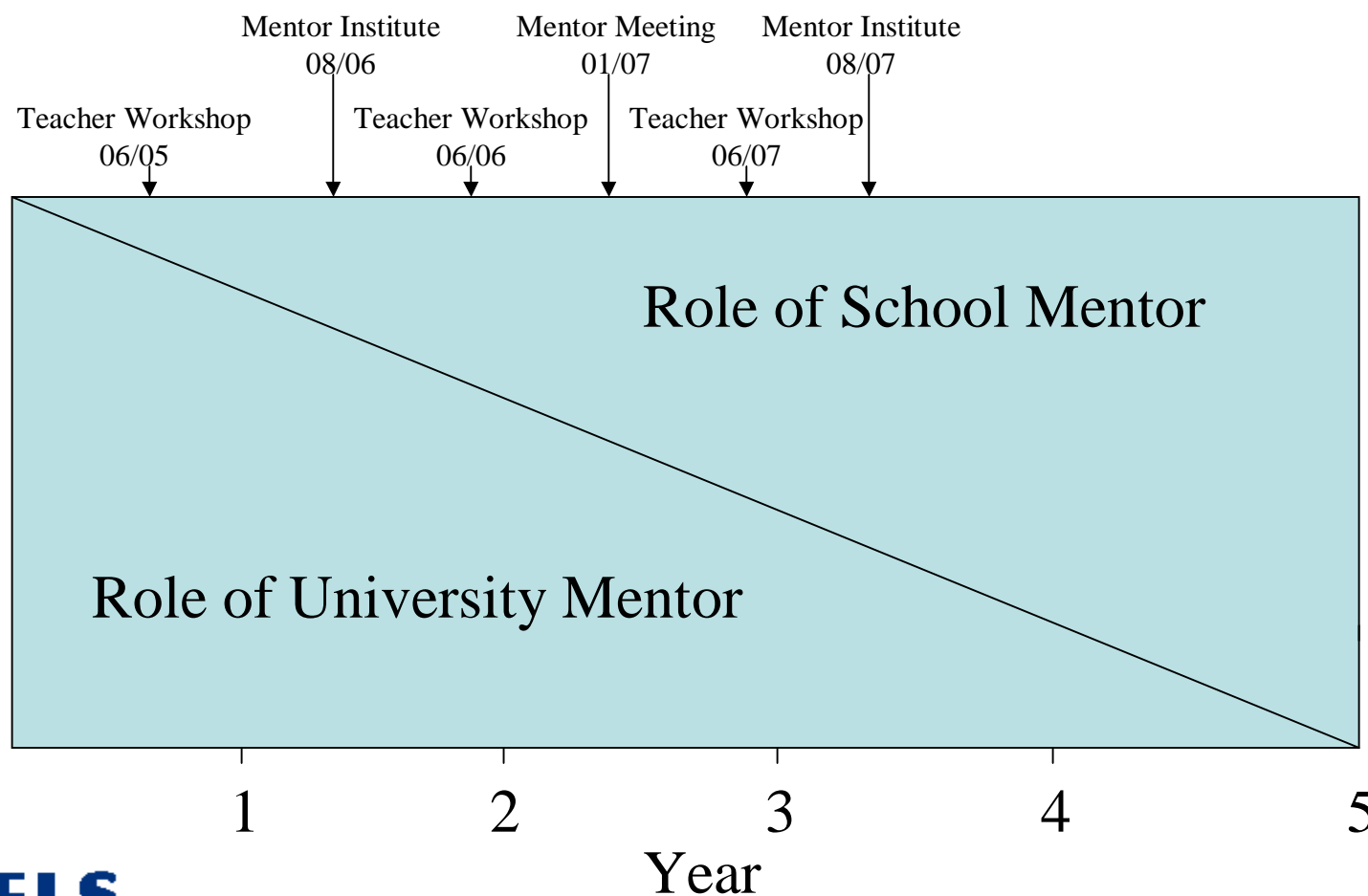
Teachers

- Review evidence of students' understanding
- Build rubrics to assess understanding
- Use student responses to customize project and revise teaching strategies



Support School Mentors

Face to Face Milestones



Support School Mentors

Online Community

Planning

Enactment

Reflection

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Reflecting on students' work in the project you reviewed, what evidence do you see of students' understanding and difficulty?

In Hanging with Friends, the students appeared to understand the definition of velocity. They showed this by using proper terms in their responses. Students also calculated speed correctly and mentioned how easy this was using the models. Students showed less evidence of comprehension in the graphing section. They left many responses black.



TELS Assessments: Cohort Comparison Study

- Hee Sun Lee
- University of California, Berkeley



TELS Annual Assessments Participants

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Hee Sun Lee, Tufts University

	TELS Students (N)	Non-TELS Students (N)	Teachers (N)	Schools (N)
2004 Spring	--	3716	51	16
2005 Spring	3443	1064	50	13
2006 Spring	4767	906	84	19



TELS Module implementation

	TELS Modules	Module Runs	Teachers	Schools
2004 -5 year	10	64	45	16
2005-6 year	16	105	73	28



2004-5 TELS Impact on student knowledge integration

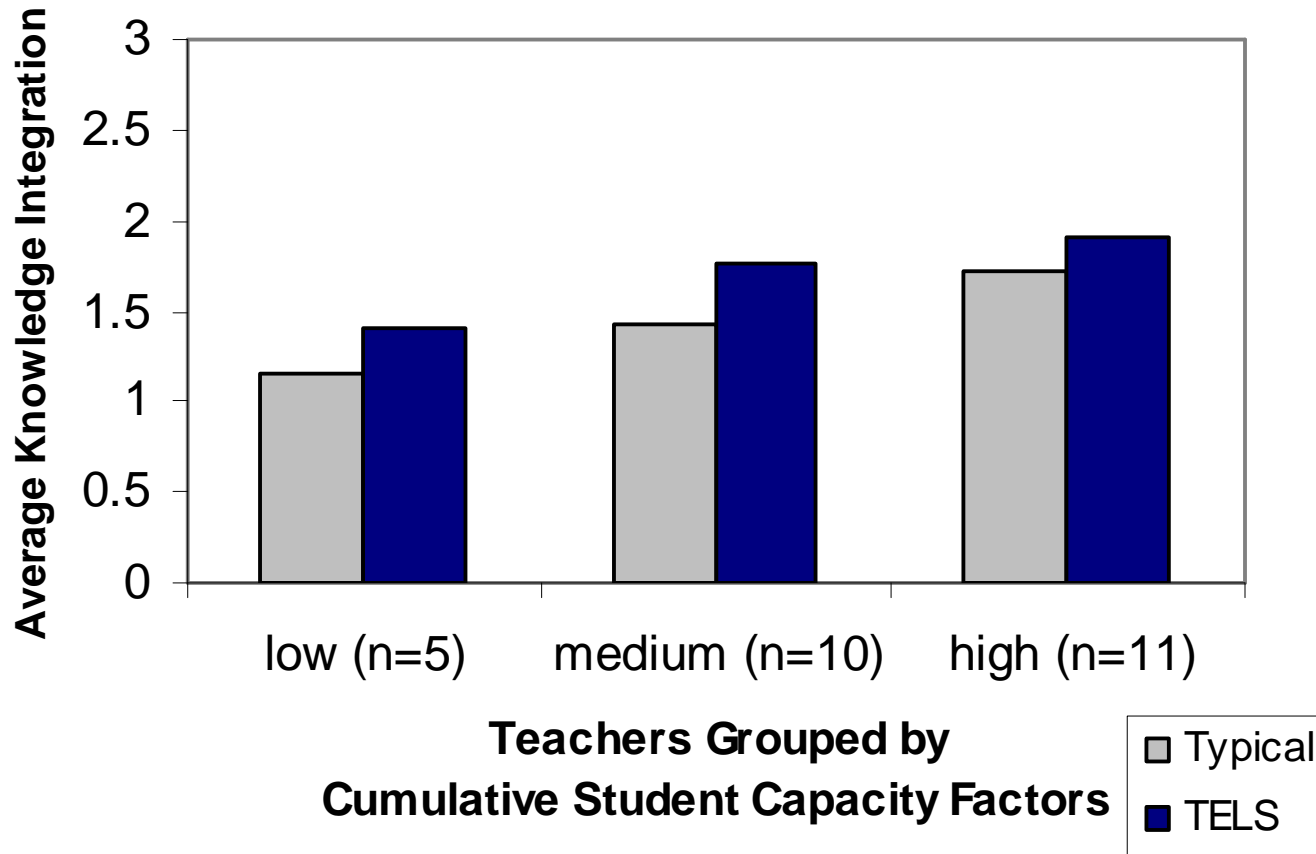
School Level	Subject	Teachers (N)	Students Typical (N)	Students TELS (N)	ES
Middle School	Physical S.	4	404	578	.16*
	Life S.	5	233	689	.35***
	Earth S.	5	549	716	.64***
High School	Physics	5	155	148	.09
	Chemistry	1	72	75	.81***
	Biology	6	241	468	.11
	Total	26	1654	2674	.32***

Students' average knowledge integration was measured with a set of three extended explanation items. Each explanation item was scored in the range of 0 to 4.



Student Background Factors

Such as language learners



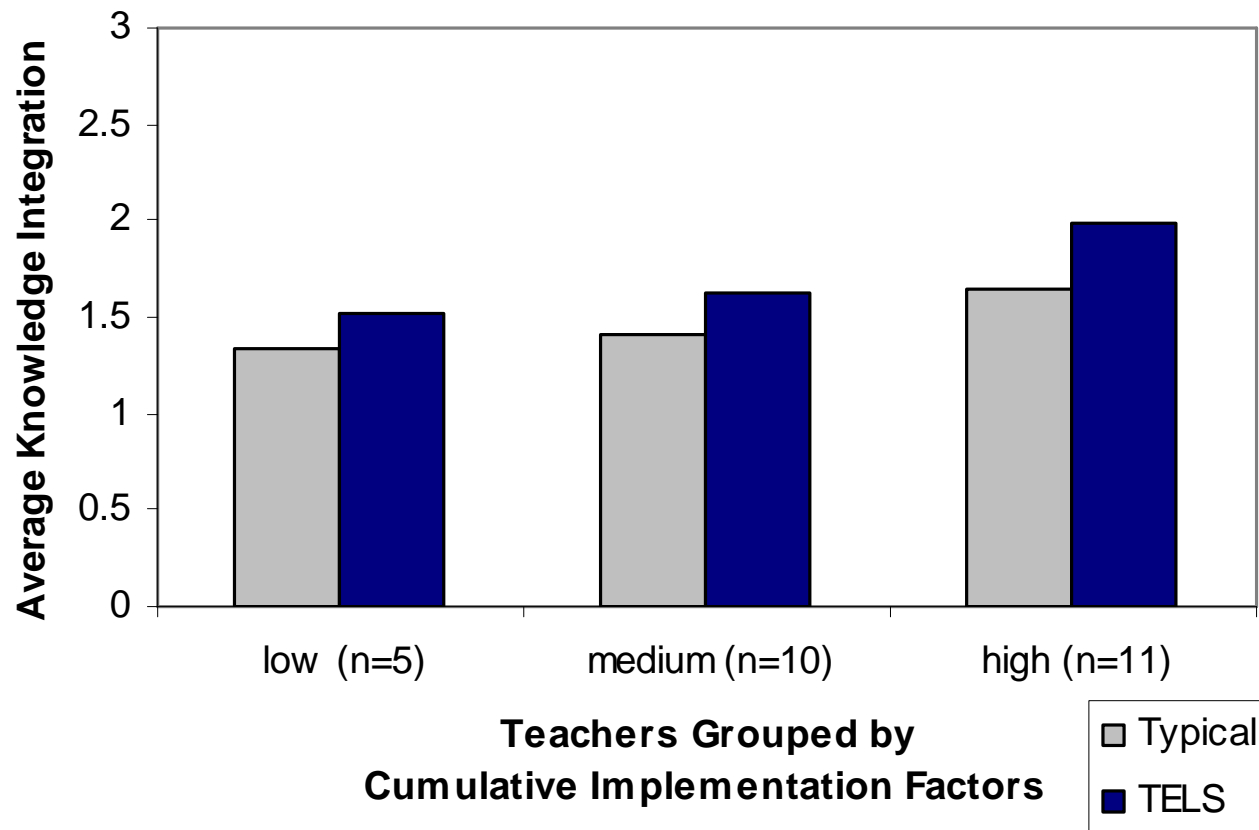
Low: 0 – 1
Medium: 2 – 3
High: 4 - 5

main effect, $F(1, 22) = 11.39, p < .01$



Implementation Factors

Such as completing module



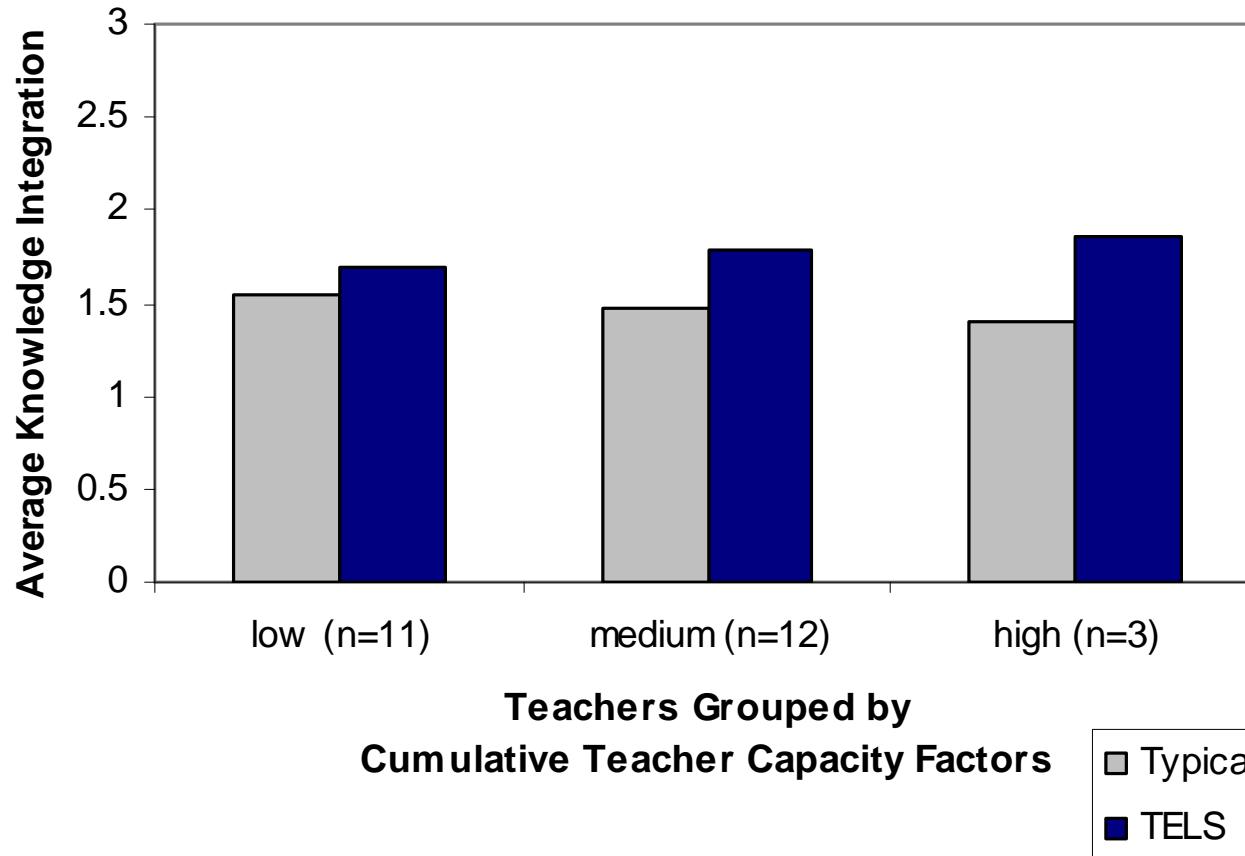
Low: 0 – 1
Medium: 2
High: 3 - 4

main effect, $F(1, 22) = 6.49, p < .05$



Teacher Experience Factors

Such as inquiry teaching



Low: 0 – 1
Medium: 2
High: 3

Interaction effect with knowledge integration change $F(1, 22) = 4.55, p < .05$

Conclusions

- Combine face to face and online professional development
- Start with targeted face to face session
- Provide support for initial obstacles like technology use
- Provide online checklists and guidance for teachers
- Gather evidence of student work online
- Enable teachers to analyze evidence and reflect on progress online and face to face
- Provide support for customizing instruction based on evidence of student success



Conclusions

- Powerful visualizations in TELS modules can contribute to learning and add value over traditional instruction.
- TELS design process, using evidence, can improve modules.
- TELS PD process can enhance student learning
- Join us to explore these and related questions about Technology-Enhanced Learning in Science.



Opportunities to participate

- TELS/WISE tested modules are free and available over the internet (<http://www.wise.berkeley.edu>)
- TELS software is available and open source (SAIL: <http://sail.sourceforge.net>)
- TELS Professional development model enables teachers to quickly begin using modules and design their own additional supports; TELS Assessments are available and have accepted psychometric properties; (see <http://TELSCenter.org>)
- TELS Design Principles database is on-line and available for use in courses, customization activities, and design (see <http://www.design-principles.org>)



Technology Enhanced Learning in Science (TELS)

- National Science Foundation Grant No. 0334199
- Participants: Marcia Linn, James Slotta, Bob Tinker, Freda Husic, Paul Horwitz, Jane Bowyer, Chris Hoadley, Tun Nyein, Yael Kali, Raj Chaudhury, Doug Clark, Gail Hollowell, Beverly Jones, Ken Bell, Turadg Aleahmad, Michele Spitulnik, Doug Kirkpatrick, Keisha Varma, Libby Gerard, Erika Tate, Tara Higgins, Kevin McElhaney, Jennie Chiu, Helen Zhang, Ji Shen, Stephanie Corliss, Beat Schwendimann, Tamar Ronen Fuhrmann, Hee-Sun Lee, Joey Lee, Yaakov Snyder, Alton Lee, Kristina Duncan, Abbey Novia, Anthony Perritano, Hiroki Terashima, Ed Burke, Scott Cytaki, Stephen Bannasch, Jon Breitbart, David Crowell, Beth Rajan Sockman, Cassandra Palmer, Brett Chambers, Matt Fishbach, Priscilla Robinson, Ariel Owen

