

The National Survey of Computer Technology and Instructional Reform

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TLC Project: Purpose

To investigate the conditions under which teachers' **use of computers** is related to **teaching practice** consistent with instructional reform theories.

Model of Instructional Reform I:

Emphasize Teaching for Understanding

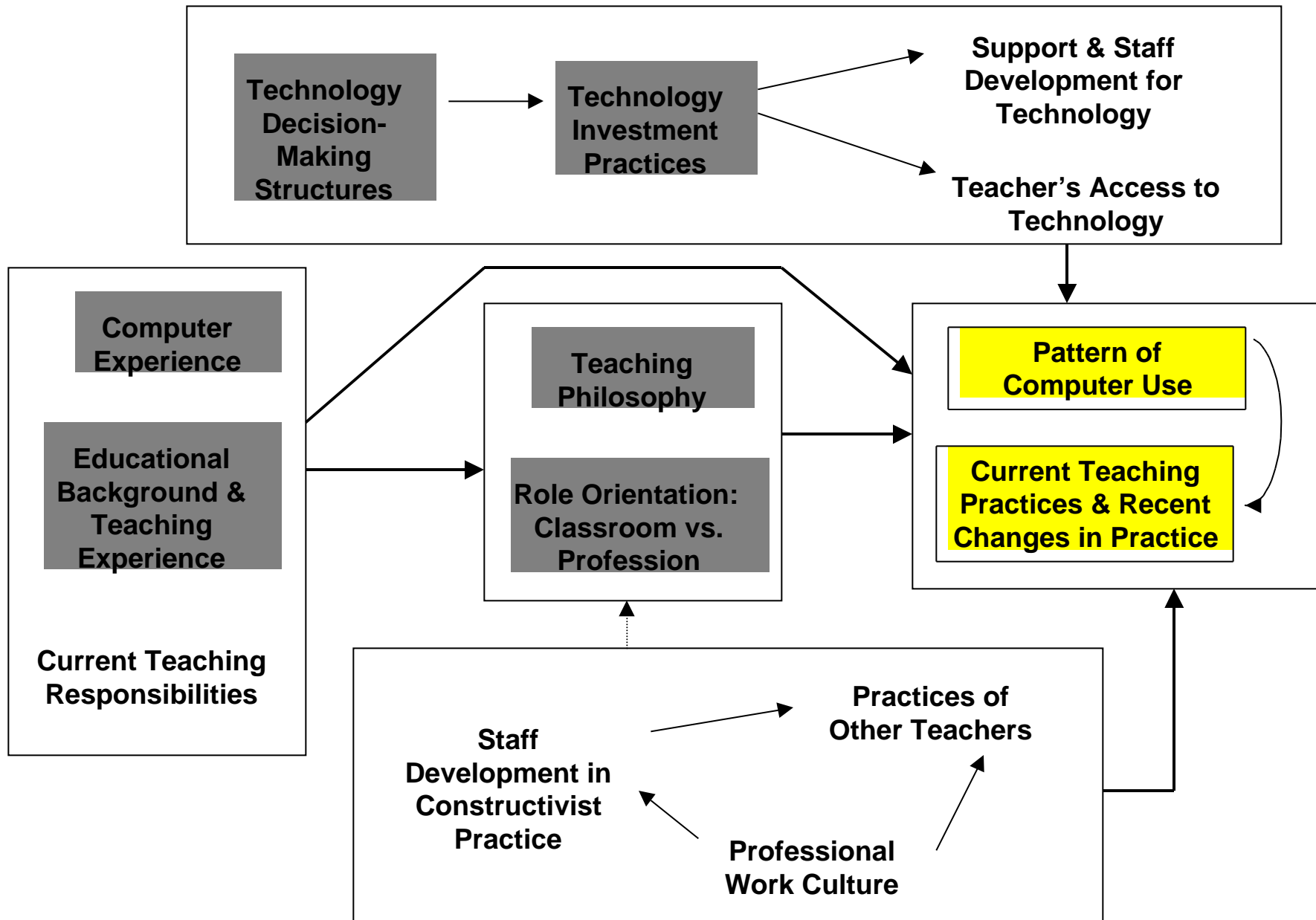
- Focus on challenging objectives...
- And equally challenging tasks...
 - Students articulate reasoning (e.g., writing)
 - Revise their work
 - Peer discourse and group decision-making
 - Meta-cognition
- Made feasible by...
 - Resources: information, “thinking tools,” communication
 - Reorganizing classroom structures and roles
 - Model the learning process
 - Student responsibility and freedom
 - Meaningful tasks
- Assessment consistent with learning goals

Model of Instructional Reform II

Make Meaningfulness The Primary Attribute of Tasks

- Contextually rich learning tasks
 - Projects
 - Real world applications
 - Authenticity
 - Depth
 - Skill learning embedded
- Take students' thinking and feeling into account
 - Students' prior beliefs
 - Student interest -> tasks
 - Student choice in tasks and methods
- Reorganize classroom structures and roles
 - Cooperative work groups
 - Students given leadership roles
 - Student initiative facilitated

Model of Effects on Computer Use Practices and General Pedagogy



The School Sample in TLC

- A representative sample of all U.S. schools, public and private (Probability Sample: 655 schools participated)
- 378 schools from more than 50 major reform projects
- 182 schools with high-end technology (Purposive Sample)
- Three-quarters of sampled schools participated in the study
- National school-level estimates from Probability Sample:
488 principals and 467 school technology coordinators,
each in 65 to 70% of the participating schools

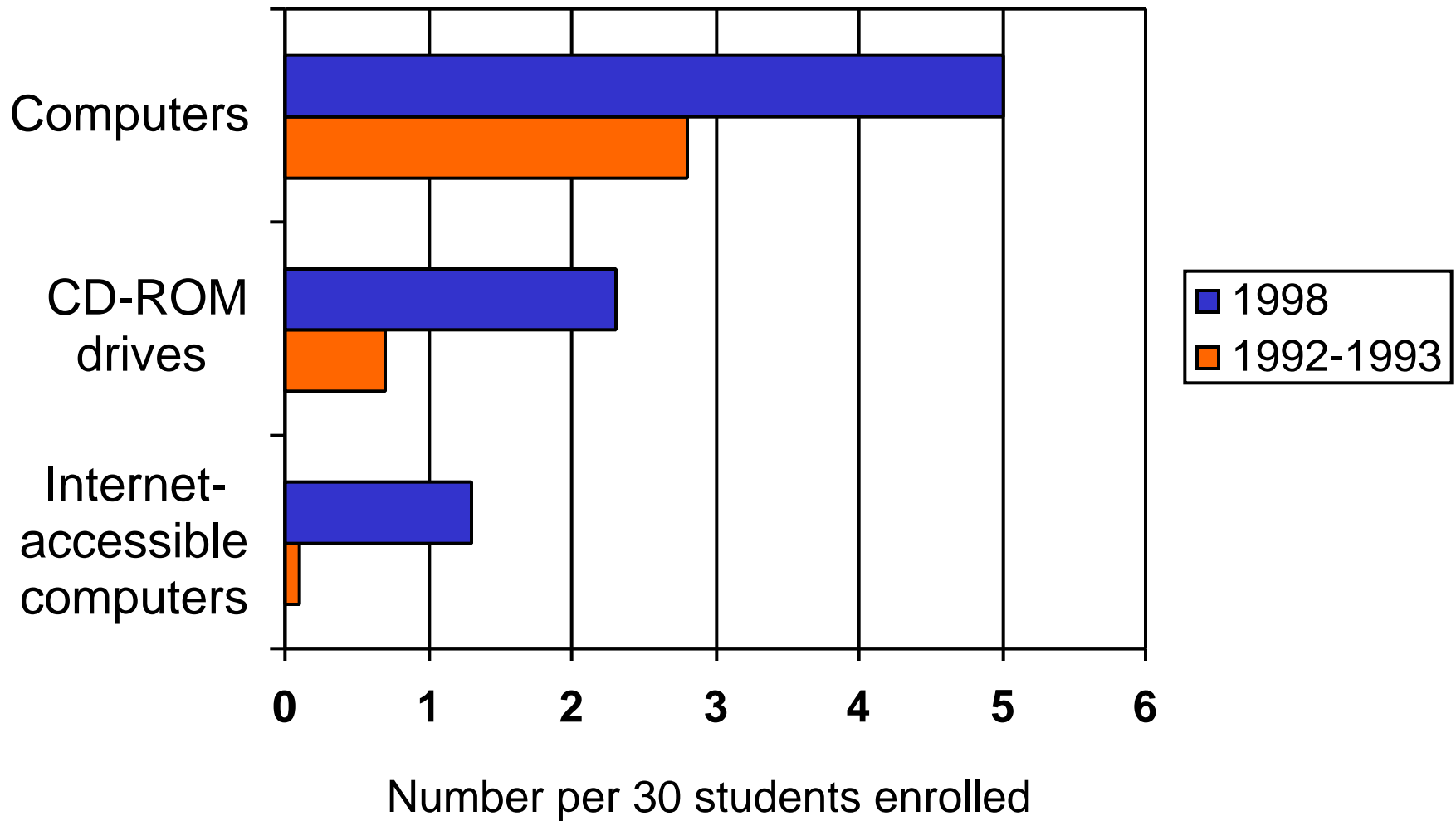
The Teacher Sample in TLC

- Over 4,100 teachers from grades 4-12 participated, nearly 70% of those sampled
 - Completed 20 page questionnaires
 - Four different versions; heavily overlapping questions
- The sampling process disproportionately selected active computer-users and reform-oriented teachers.
 - BUT data was re-weighted to reflect a “simple random sample” of teachers
- Parts of this presentation use data only from the Probability Sample: 2,251 teachers

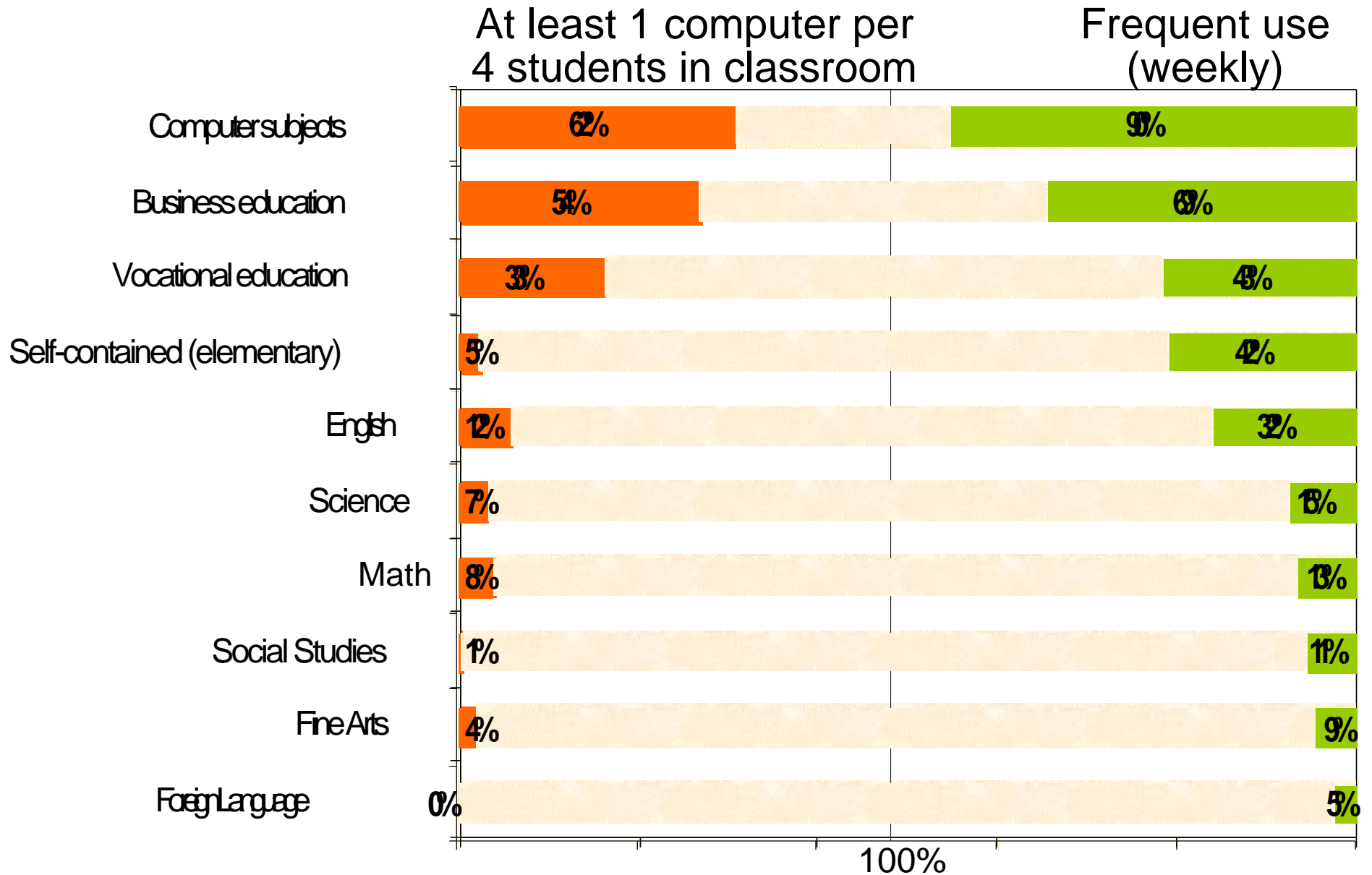
Penetration of Computers into the Lives of Teachers and Students

Yani Wong

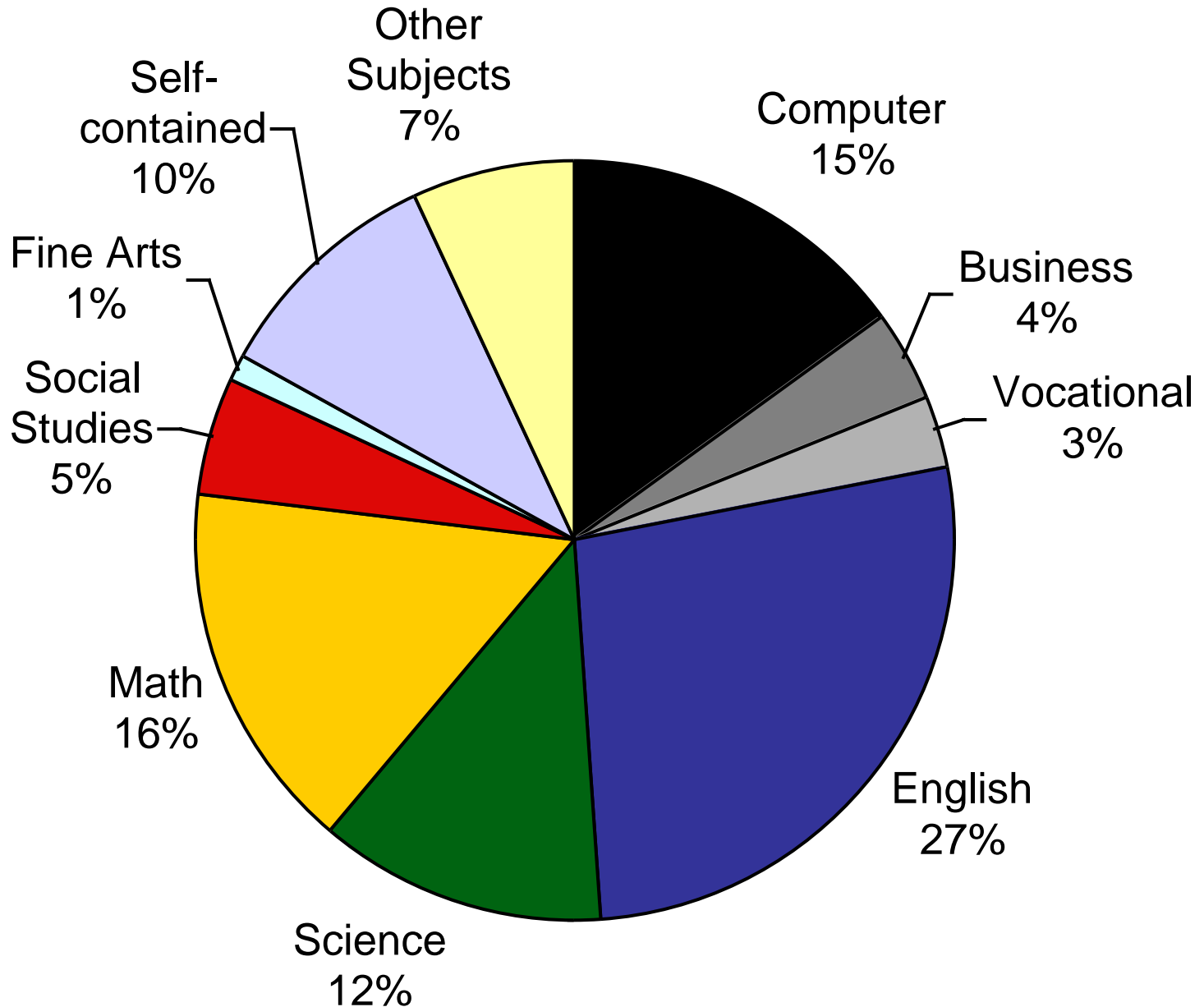
School Technology Presence, 1992-98



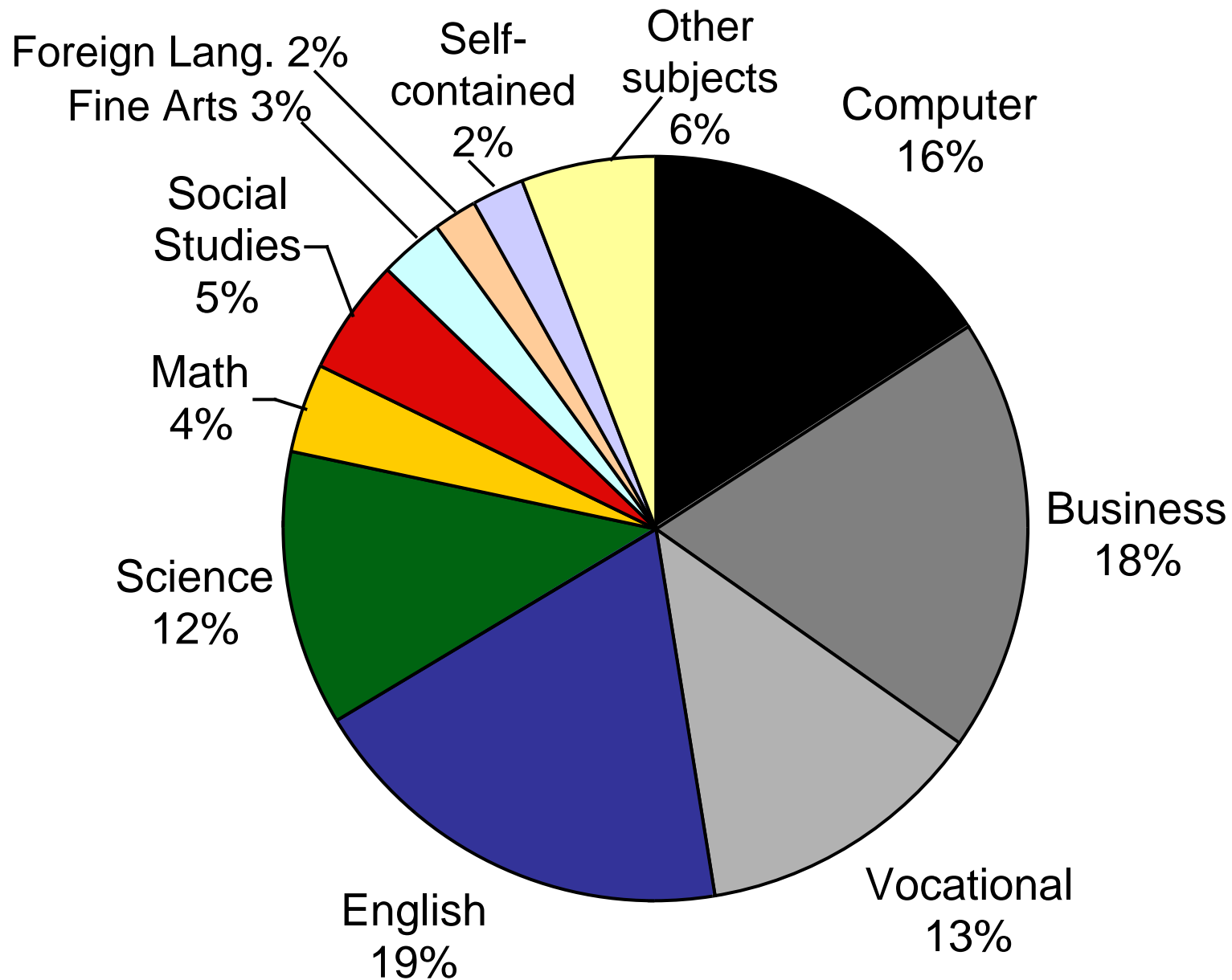
Classroom Access and Use by Subject Taught



All Teachers Who Use Computers Frequently With Students in Middle School

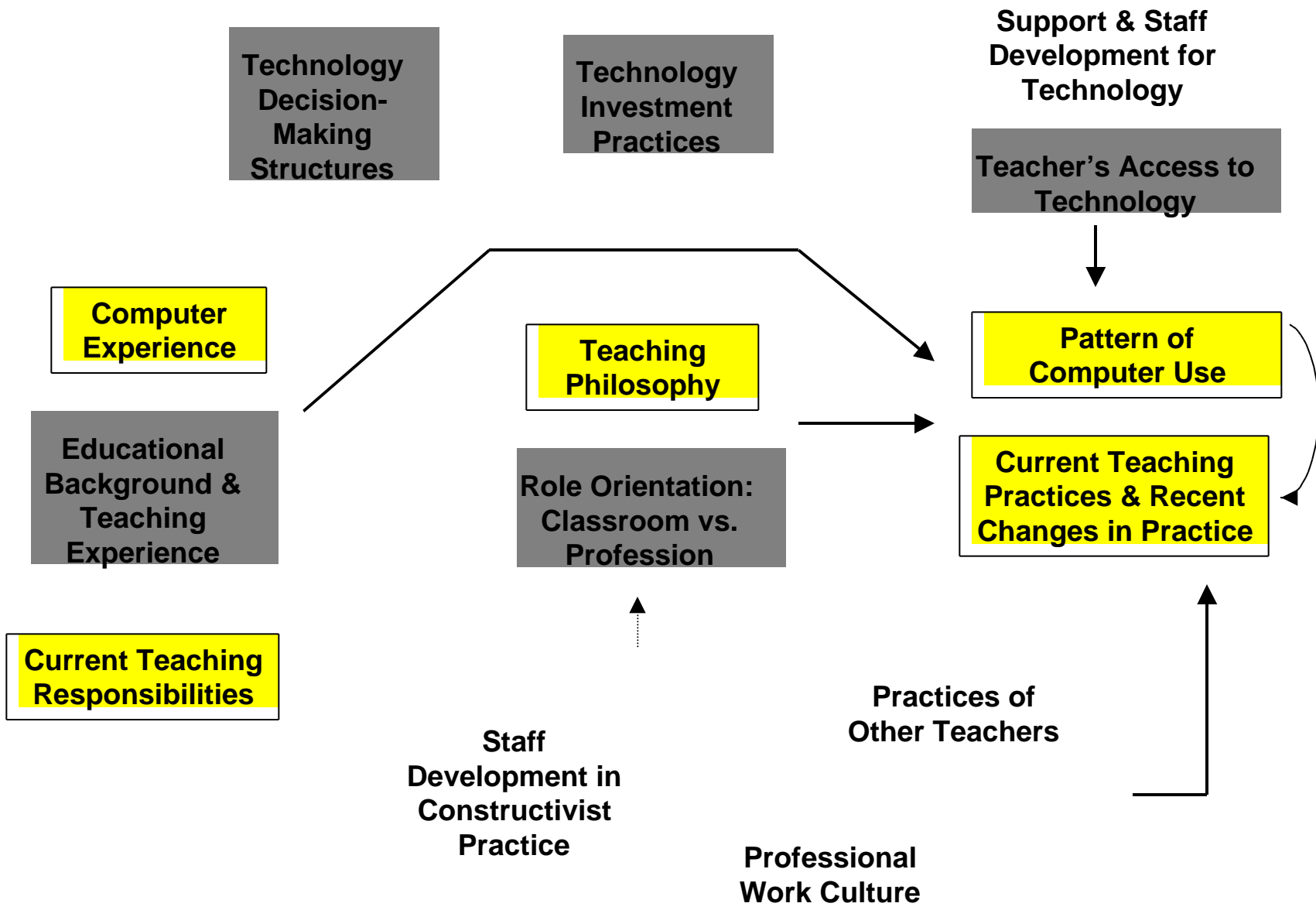


All Teachers Who Use Computers Frequently With Students in High School



Technology's Role in Constructivist Reform

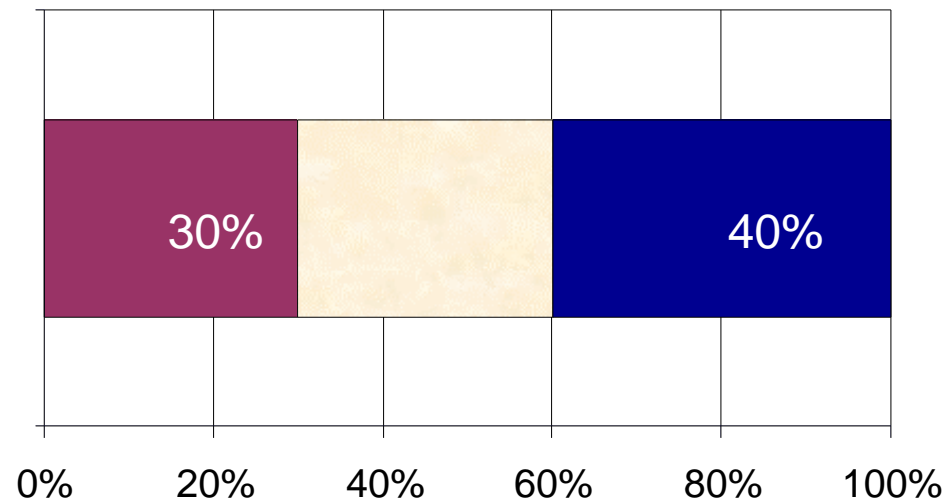
Hank Becker



Teaching Philosophy: Teacher as Instructor Or Facilitator?

Instructor

“My students won’t really learn the subject unless you go over the material in a structured way. It’s my job to explain, to show students how to do the work and to assign specific practice.”



Facilitator

“I try to provide opportunities and resources for my students to discover or construct concepts for themselves.”

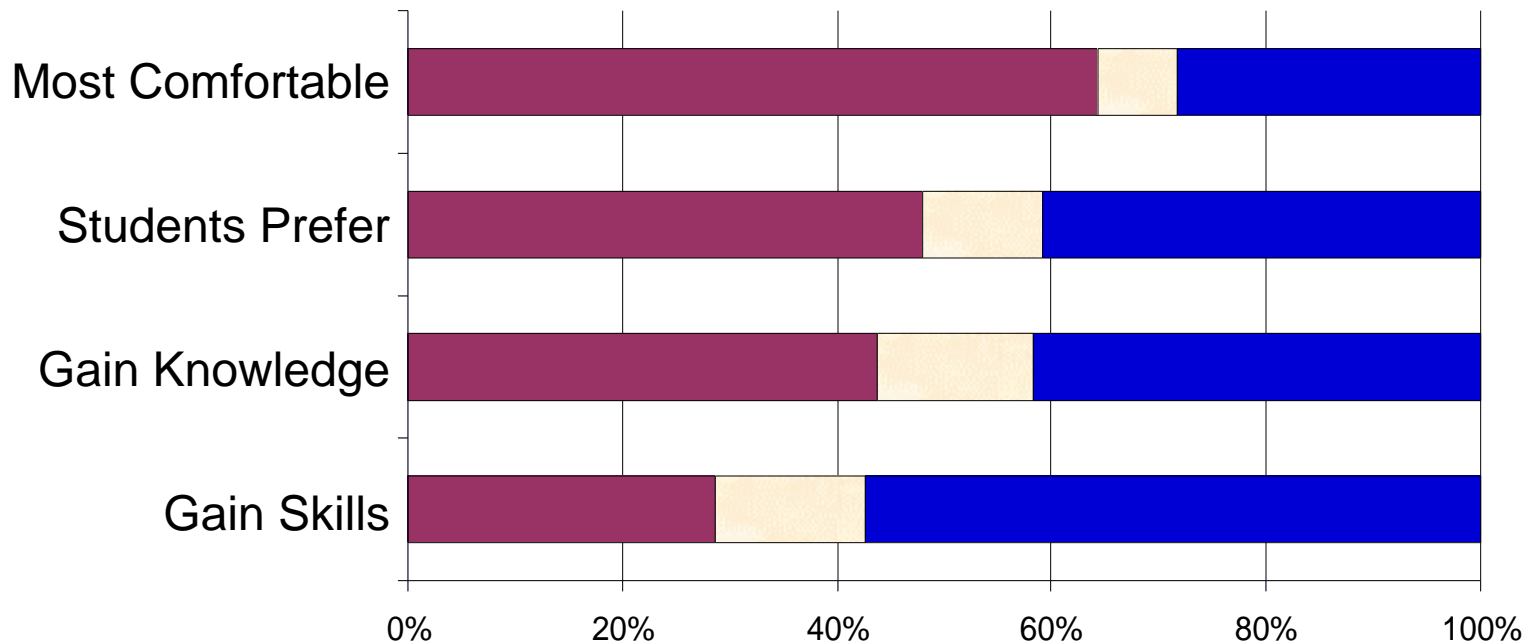
Two Teachers Compared

Ms. Hill:

Asked questions the students could answer quickly, based on reading they had done before. New material is taught using simple questions to keep students attentive.

Mr. Jones:

Many questions came from students themselves. Though Mr. Jones could clarify questions and suggest sources of relevant information, he couldn't really answer most of the questions himself.



Philosophy Index

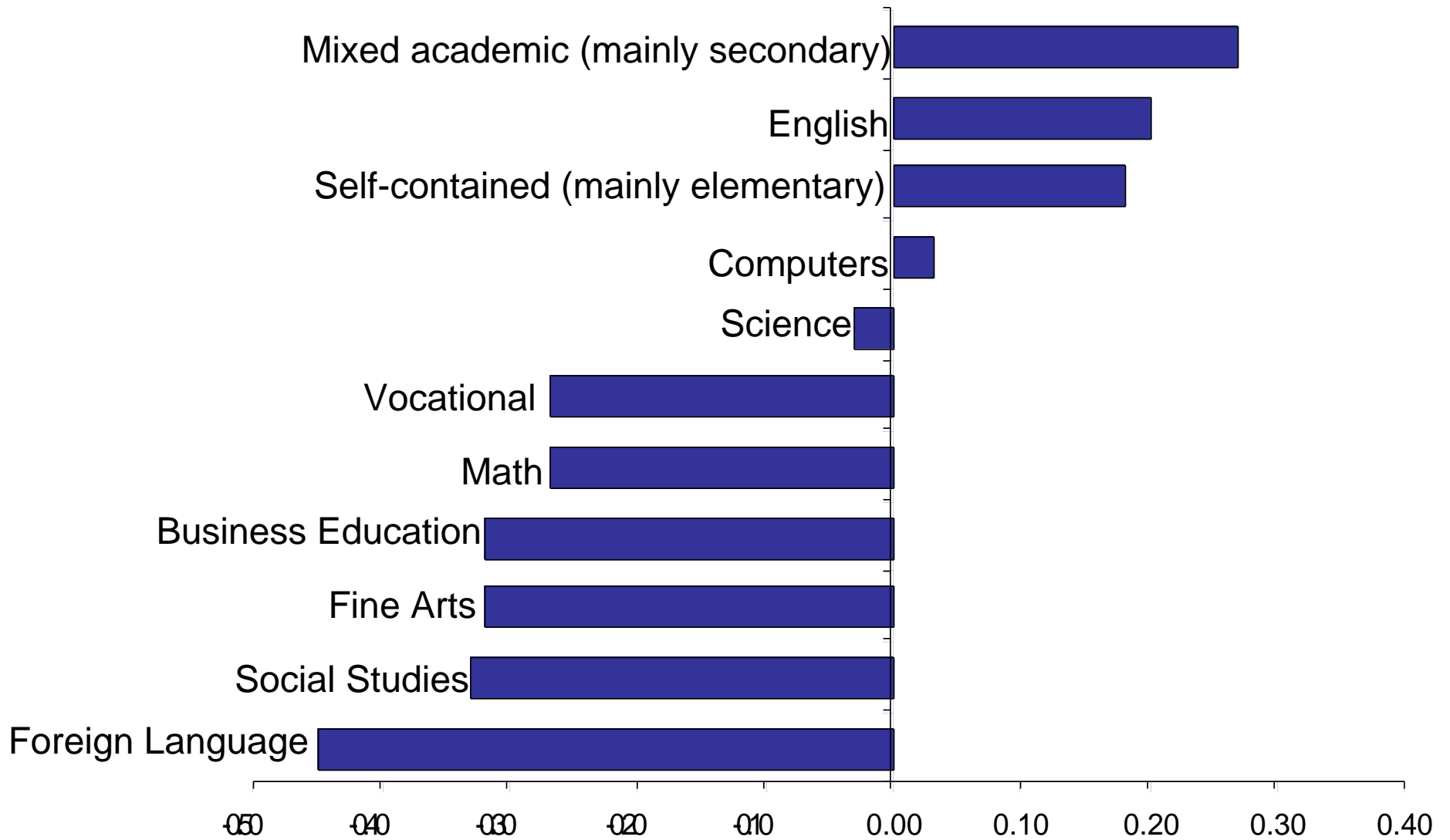
Constructivist Philosophy

- Knowledge is built through class and group discussions
- Students need to find answers to their own questions and problems
- Students construct concepts for themselves
- “Sense-making” and guided inquiry
- Authentic, integrated tasks
- Diverse classroom projects

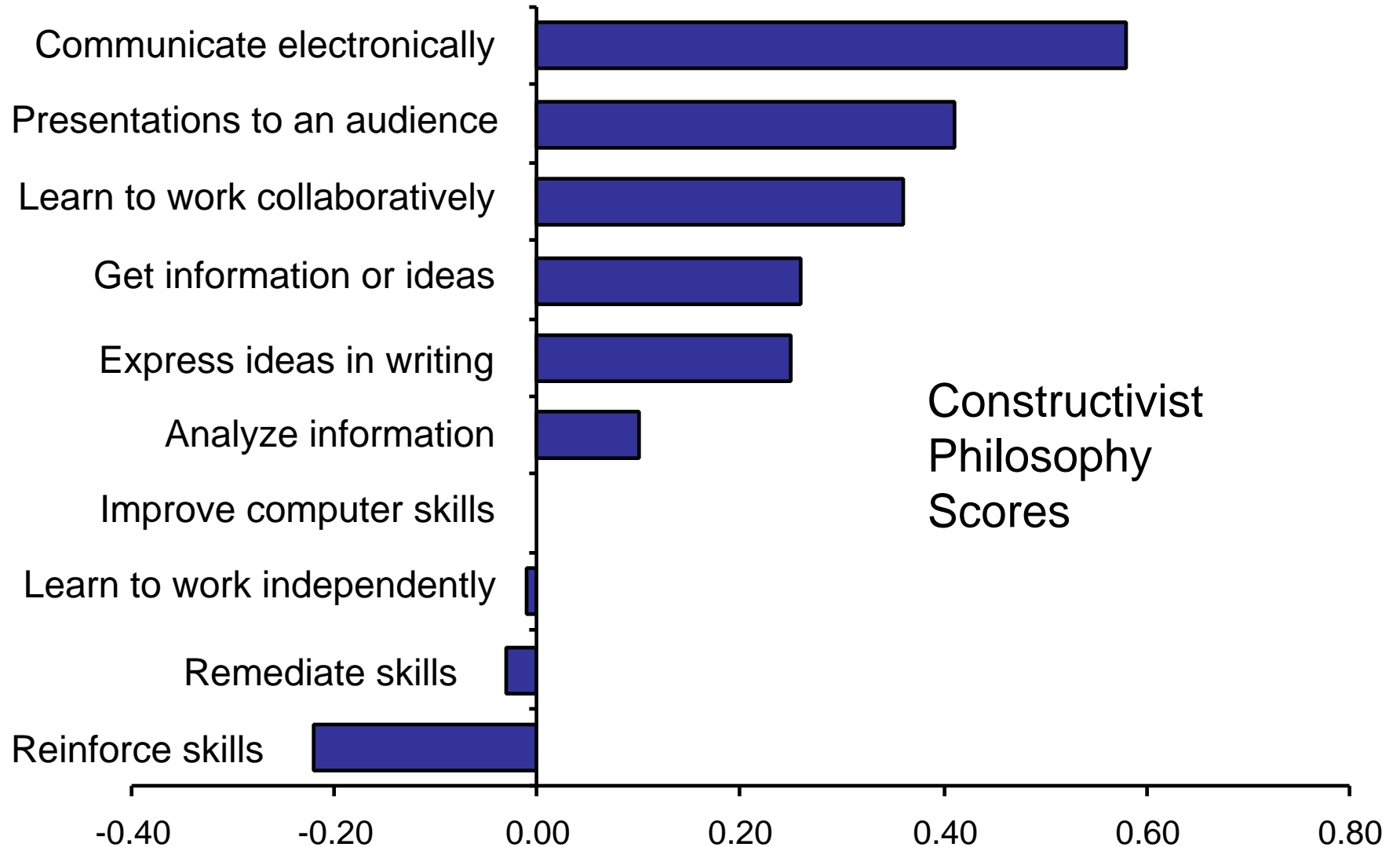
Traditional Philosophy

- Teachers describe and explain concepts, and students learn this content
- A quiet classroom is important for learning
- Acquiring basic content knowledge and skill primary
- Teacher - not students - determine activities
- Instruction is built around problems with clear, easily found, correct answers
- Teaching facts and skills provides the foundation for later learning

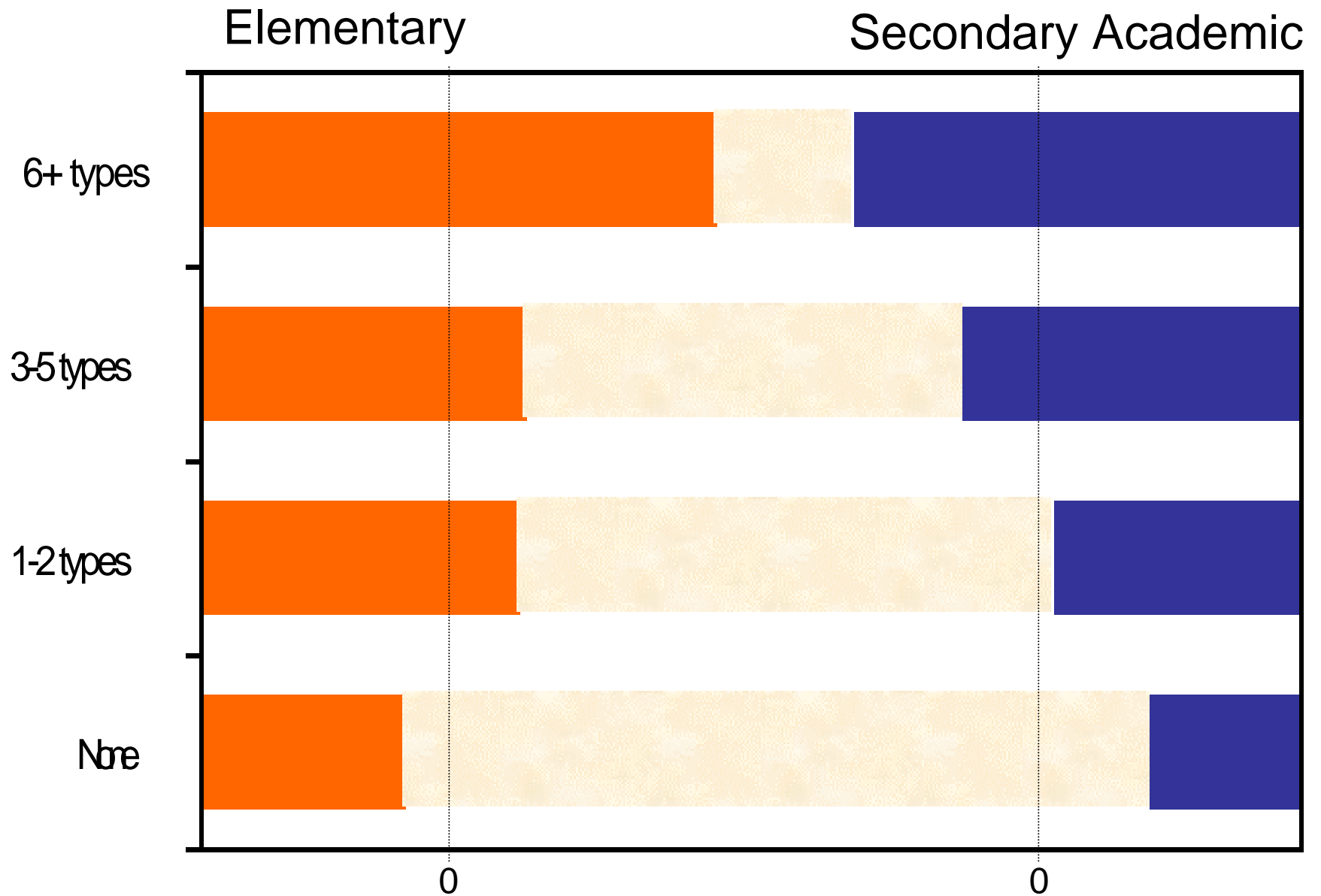
Constructivist Philosophy by Subject Taught



Teachers' Objectives for Computer Use Mirror Their General Philosophy (computer-using teachers)



Teachers Who Use a Greater VARIETY of Software Have More Constructivist Philosophies



Computer Use Index

- Students Used Computers More Than 20 Times During Year
- Variety of Software Was Used (5 types on 3 occ'ns)
- Presentation Software 10+ times
- Student E-Mail 10+ times
- CD-ROM Reference Software 10+ times
- World Wide Web Browser 10+ times
- Multimedia Authoring Software 10+ times
- Colloboration Objectives for Computer Use
- Written Expression Objectives for Computer Use

Changes in Pedagogy Over Previous Three Years

- Constructivist Direction

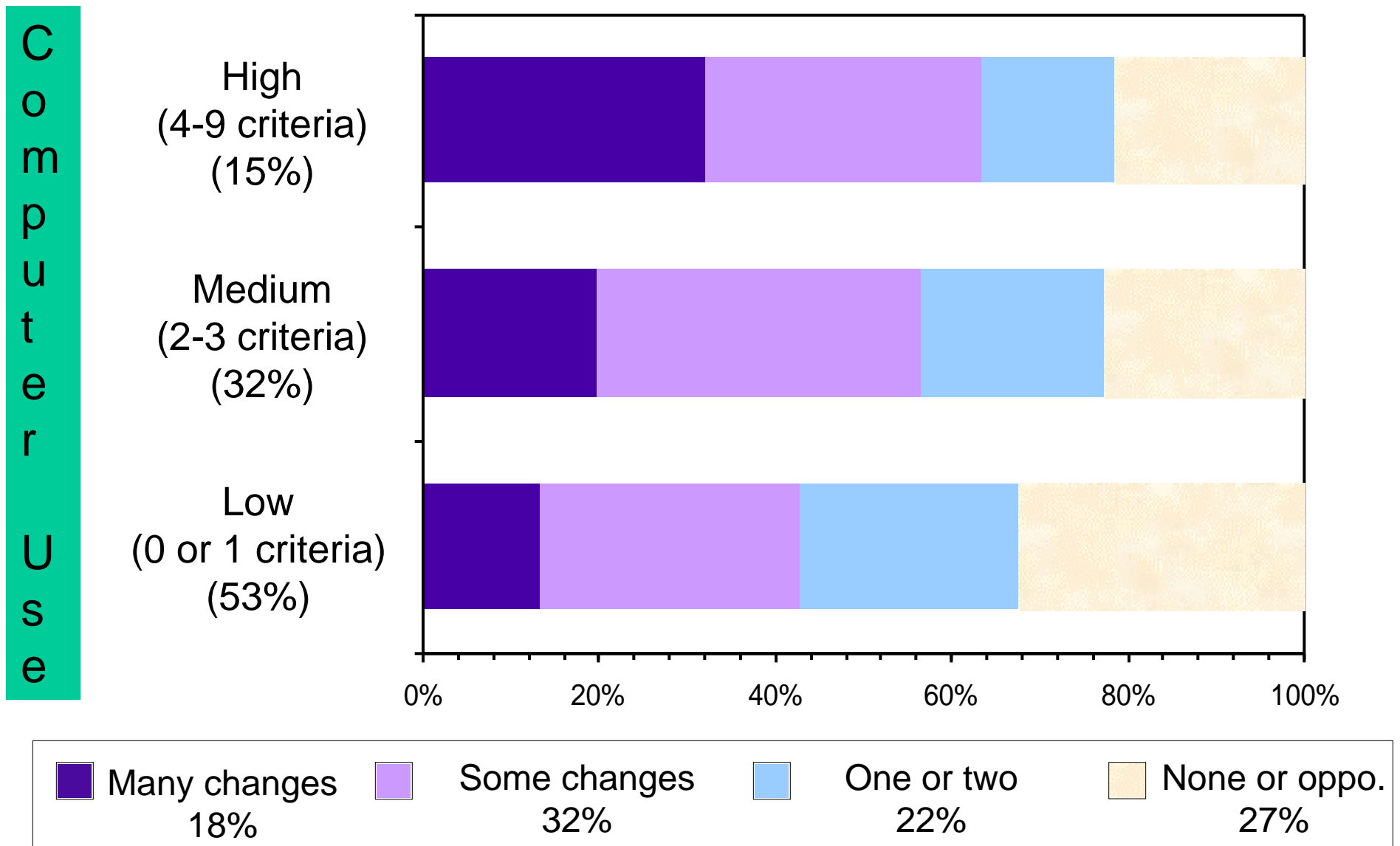
- More often have students teach or help other students.
- More often have students work on long projects.
- More often have students write a page or more on a single subject.
- More often evaluate students through their products instead of tests.
- More often allow myself to be taught by students.
- More often have many activities going on in the room at the same time.
- 5 others

- (Away from) Traditional Direction

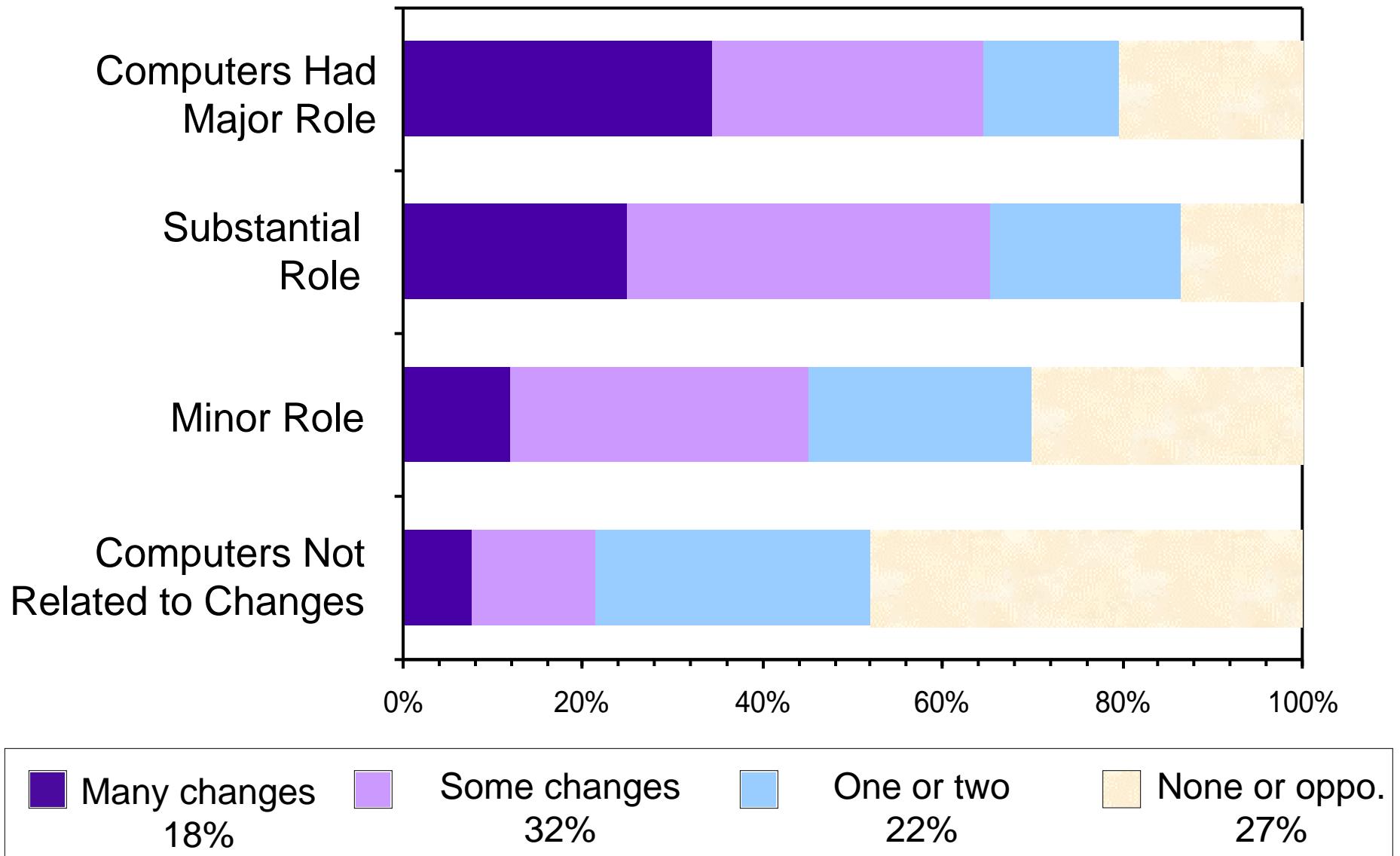
- Have students answer questions in their textbooks.
- Closely monitor and supervise students while they work.
- Plan a lesson using principles of direct instruction.
- 2 others

Teachers High on Computer Use Were More Likely to Report More Changes Towards Constructivist Practice

(among computer-using teachers)



Teachers Who Perceived Computers to Have Had a Major Role in Changes they Made Reported MORE CHANGES



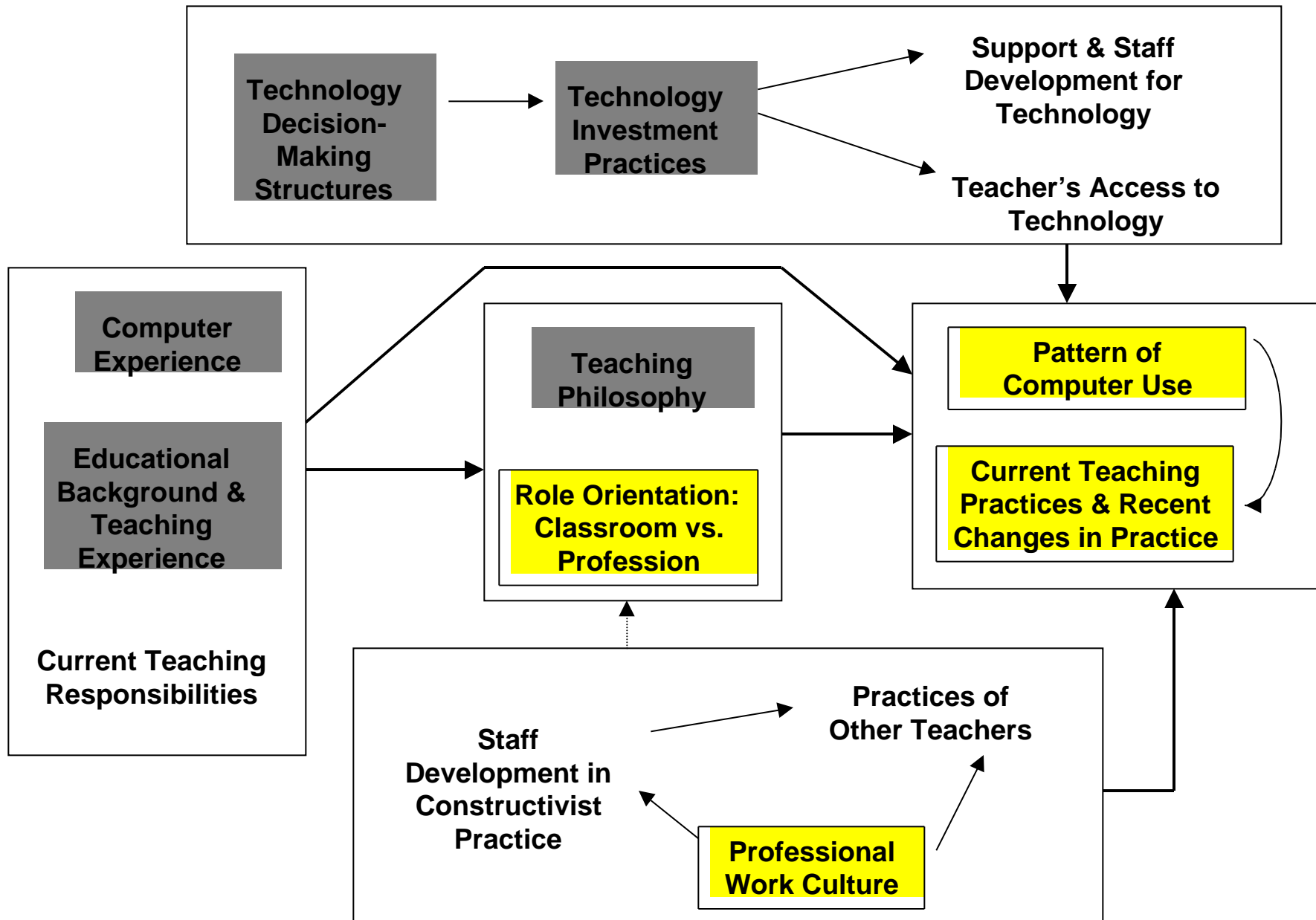
Major Computer-Related Predictors of Extent of Constructivist Pedagogical Change

- General Computer Expertise
- Variety of software used
- Collaboration objectives for computer use
- “Written expression” objectives
- Extensive use of Word Wide Web

Teacher Professionalism, Constructivist Pedagogies, and Constructivist Uses of Computers

Margaret Riel

Model of Effects on Computer Use Practices and General Pedagogy



Teacher's Work Role Orientation: Professional Leadership vs. Classroom Focus

1. Teacher Professional Contacts at School:

Discussions of Teaching, Learning, Subject-matter, Technology
Classroom Visits to Observe Teaching

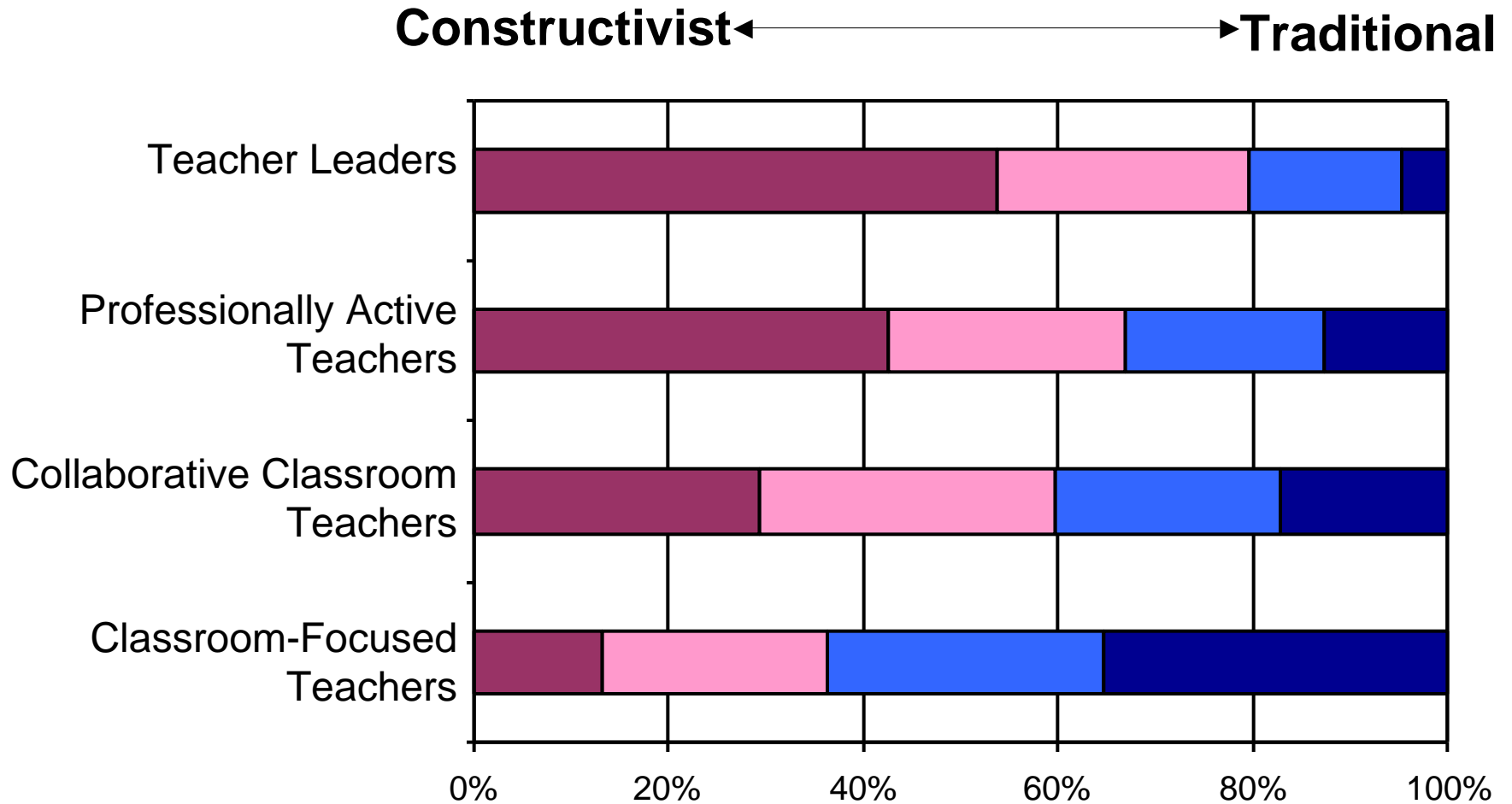
2. Teacher Interactions Beyond the School:

Attends Workshops
Participates on Committees
Professional exchanges through E-mail

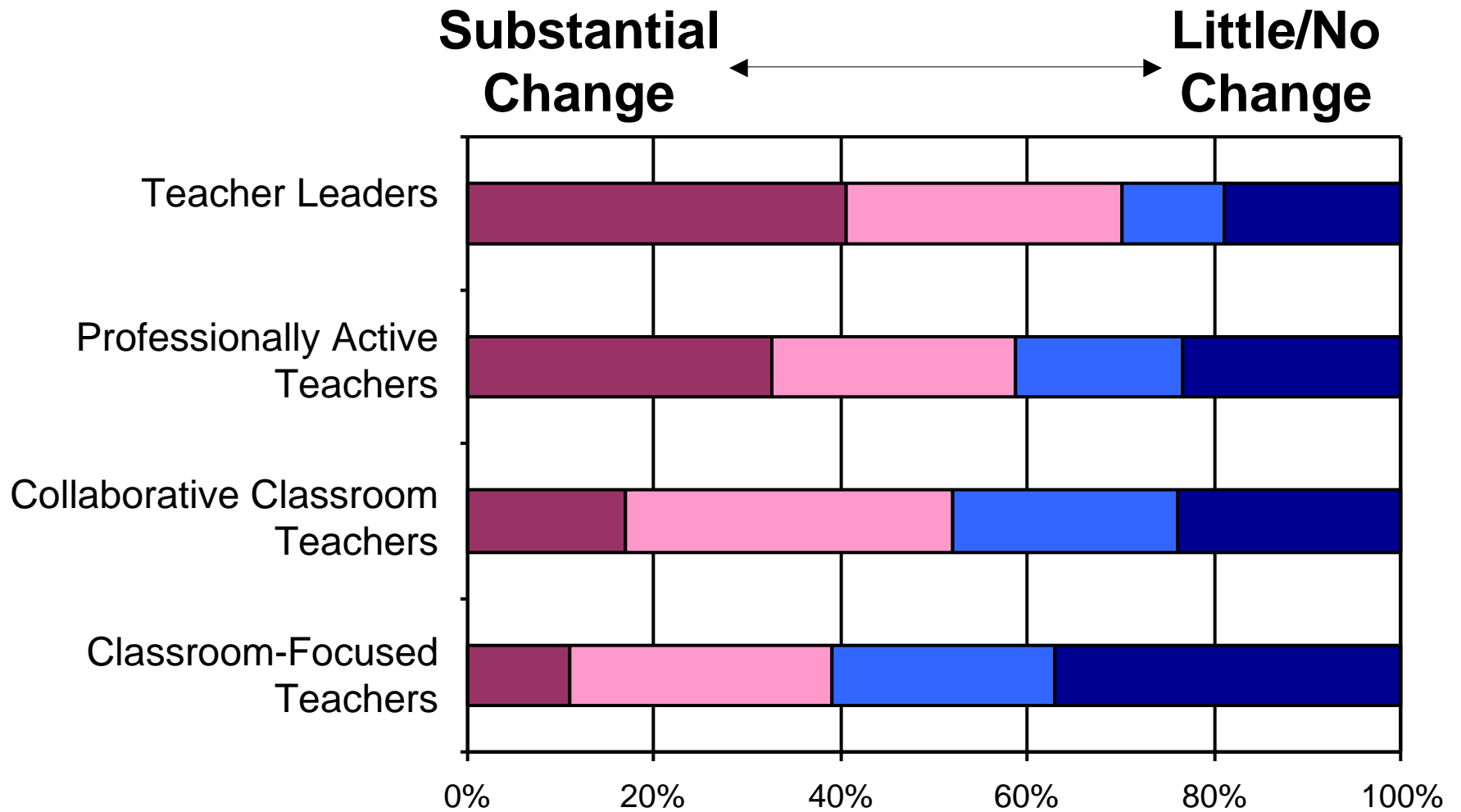
3. Leadership Activities over Past 3 Years:

Mentoring
Teaching Peers in Workshops/Conferences
College Teaching
Publishing Articles for Practitioners

Teacher Practice by Work Role Orientation



Change in Pedagogy in a Constructivist Direction



Professional School Culture

Teacher Learning Community

It is common for us to share samples of student work

Other teachers encourage me to try out new ideas

Evaluation: Teacher Recognition and Constructive Peer Criticism

Teachers who successfully innovate are given public recognition

Most teachers will press another if that person is not teaching well

Integrated, Teacher-Respecting Staff Development

Staff development is followed by support to help teachers implement ideas

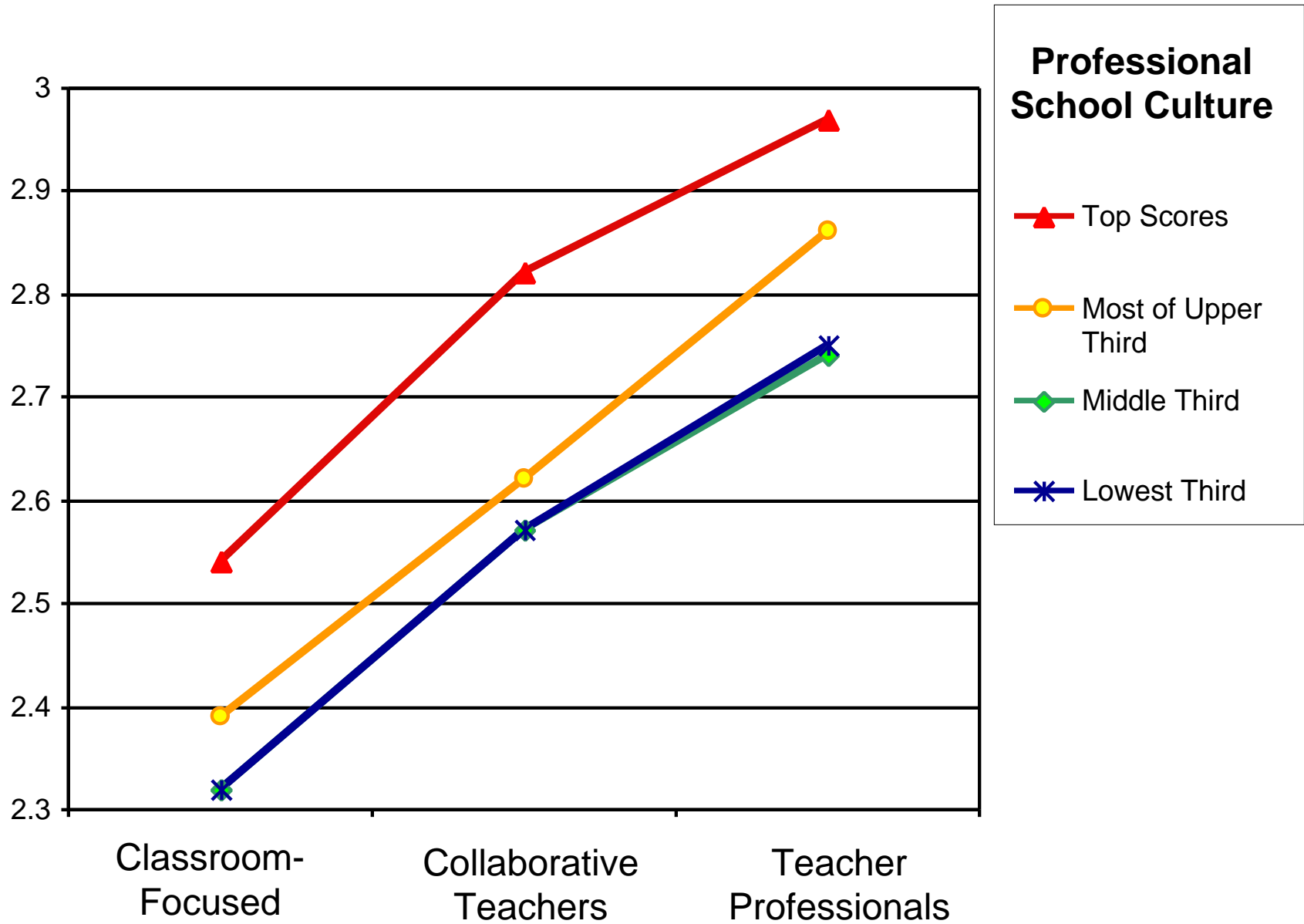
New ideas presented are discussed by teachers afterwards

Goal Consensus

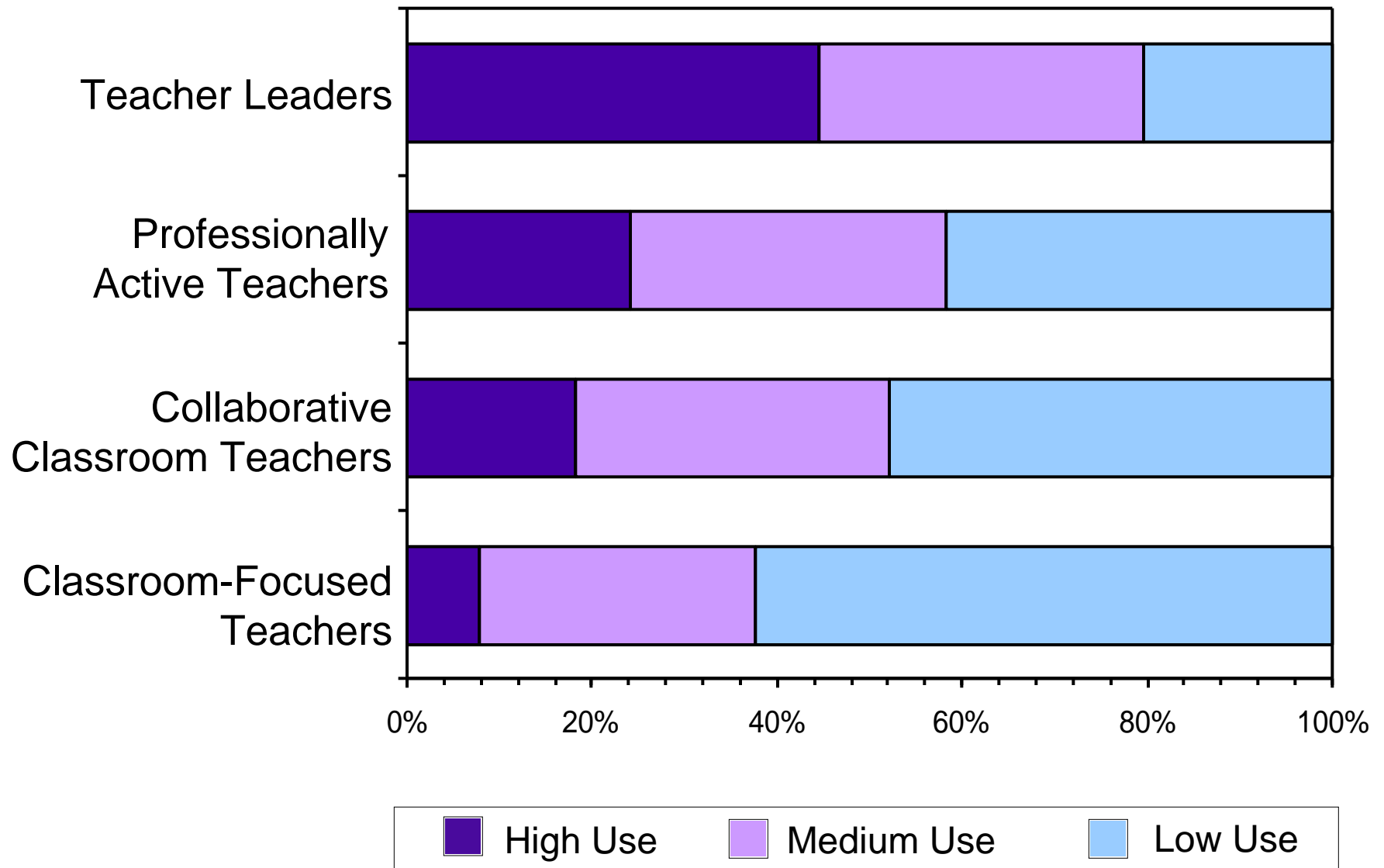
The principal's philosophy of education is similar to my own

Most teachers share my beliefs about the central goals of the school

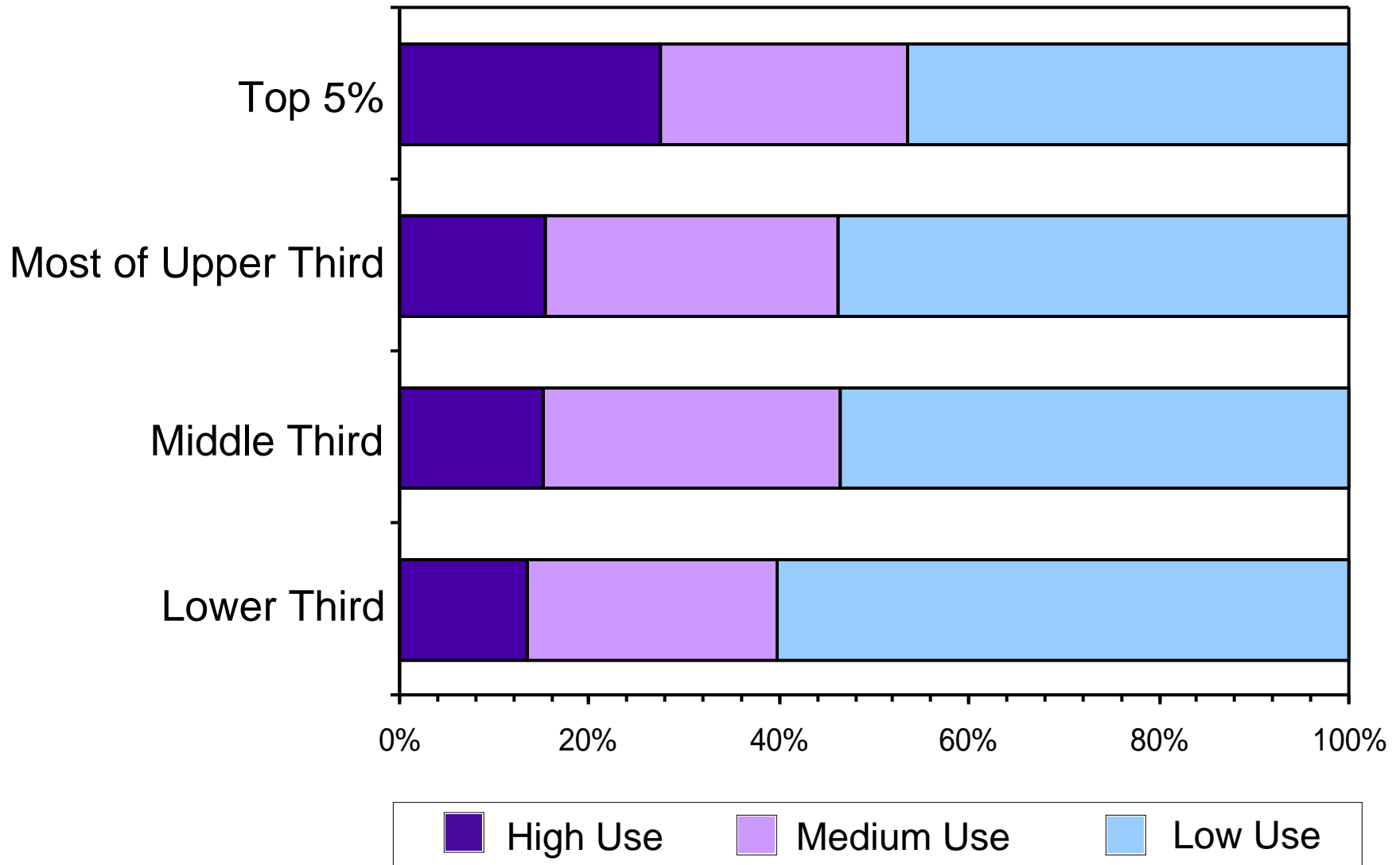
Pedagogy by School Culture by Work Role Orientation



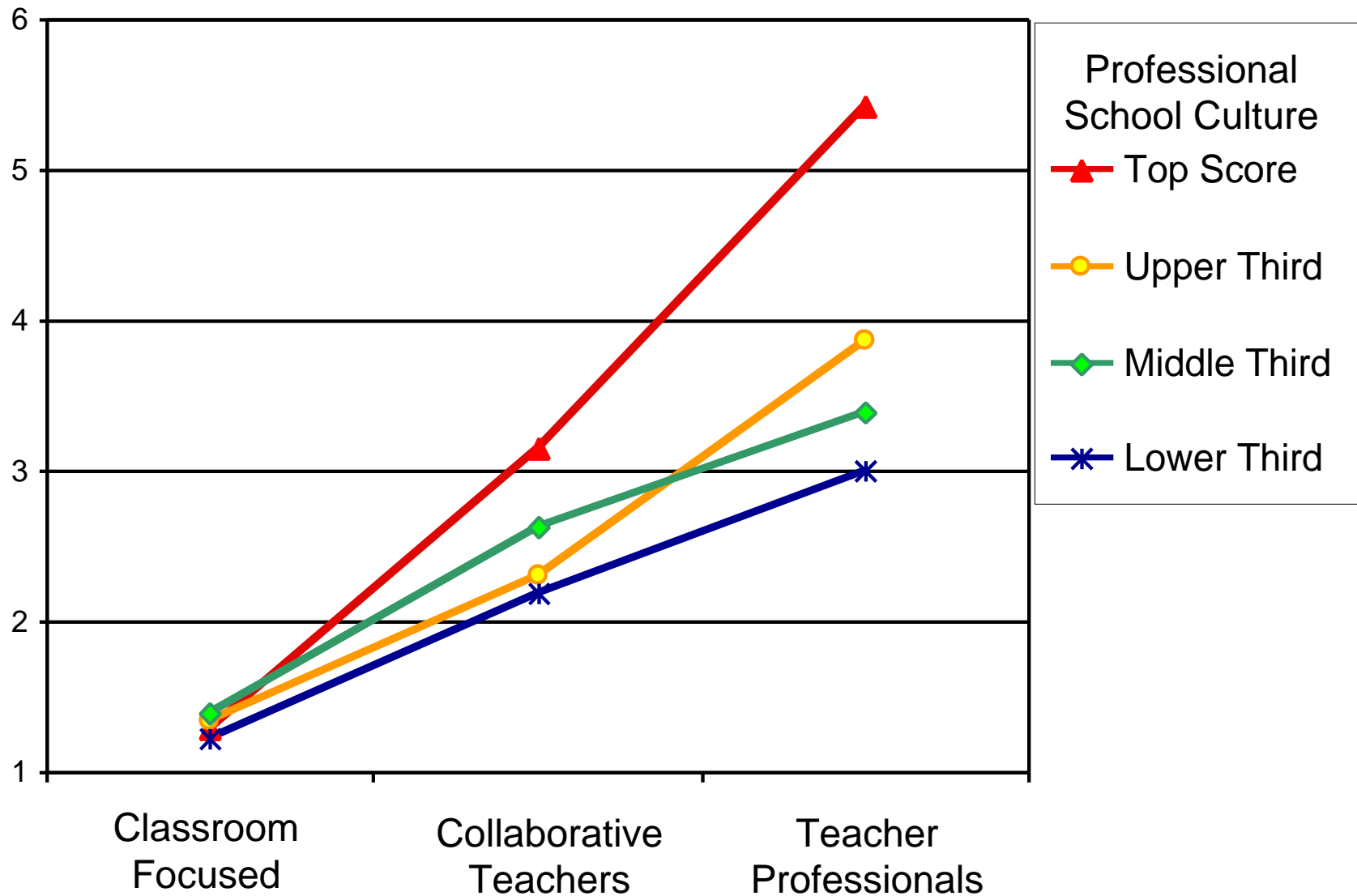
Extent and Variety of Constructivist Computer Use by Teacher Role Orientation



Extent and Variety of Constructivist Computer Use by School Work Culture



Use of World Wide Web Browser, by Role Orientation, by School Culture (Selected Subjects)



Professional Practice vs. Private Practice

The position of the teachers in the education community mirrors the position of students in the classroom community.

If teachers take leadership role in the education community, they are more likely to encourage student leadership in the classroom.

Teacher collaboration at school is linked to student collaboration in the classroom

If teachers implement ideas that are delivered to them, they are more likely to create a learning context in which ideas and skills are delivered to their students.

Private Practice is related to individualized learning practices

Instructional Technology Investments in USA Schools

Ronald Anderson

Annual Per Student Expenditures in US Schools

	Total
Instructional Computers	\$68.9
Peripherals	7.5
Video Production	1.4
Computer Furniture	2.8
Local Area Network	17.0
Internet	3.9
Computer Maintenance	3.9
Total Hardware	\$105.3

Annual Per Student Expenditures in US Schools Cont'd

	Total
Individually Purchased Software	\$5.8
Site Licenses	3.7
Total Software	9.5
Salary for Tech Support	14.3
Salary for Training Staff	5.1
Release Time	5.4
Other Training Expenses	2.6
Total Support	27.3
Grand Total	\$142.0

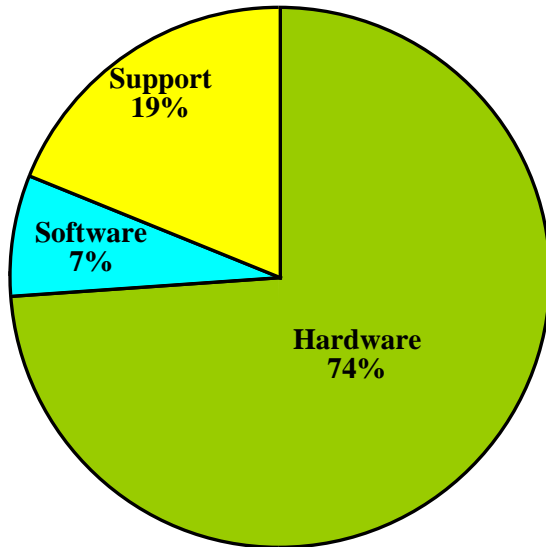
Estimating Total School IT Investments

By combining information on expenditures during the “last two years” with information on inventories and hours spent, it was possible to estimate the following:

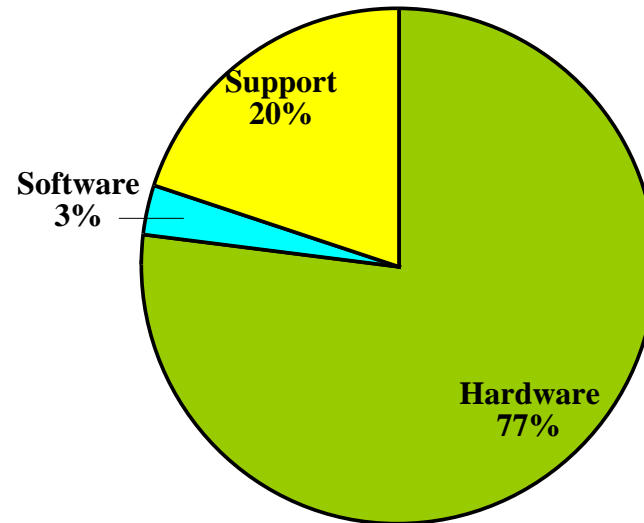
- \$1,480 per computer
- \$14 per installed software unit
(includes site licenses & purchases)
- \$18 per hour for cost of average support by tech coordinator & others
- 55% from district; 45% from school
- \$7.8 billion spent in 1997-1998

Per Student Technology Spending

Last Year

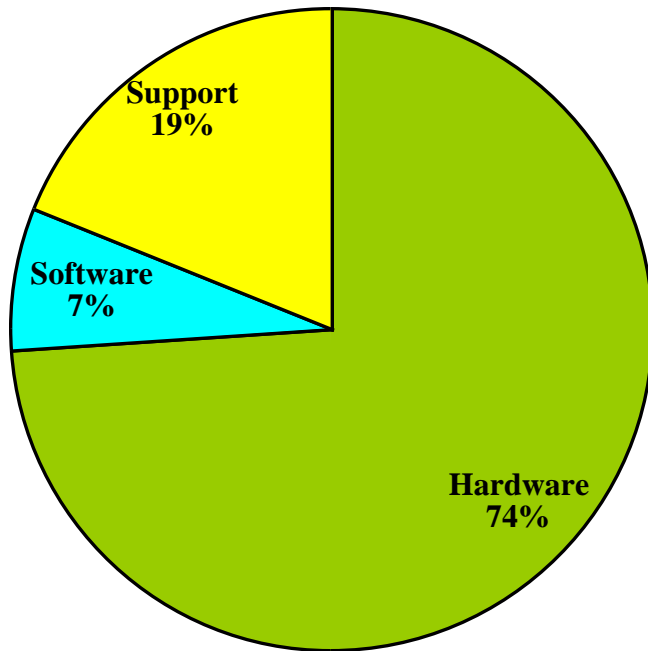


Total (5 years)

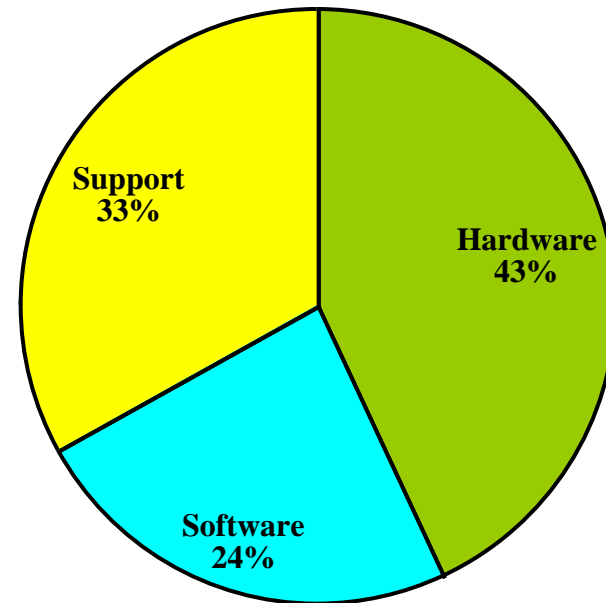


Instructional Technology Expenditures by US Schools

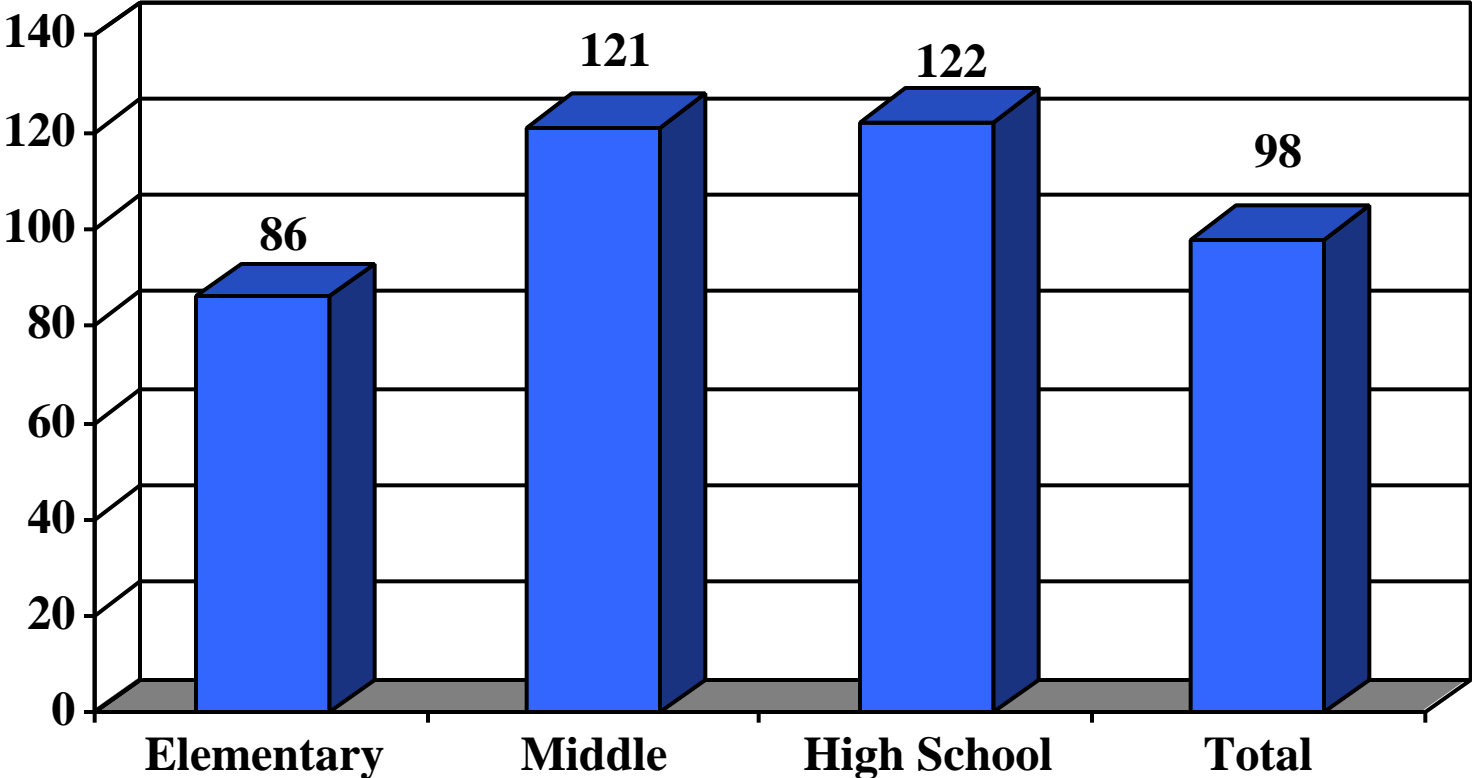
What Schools Spend



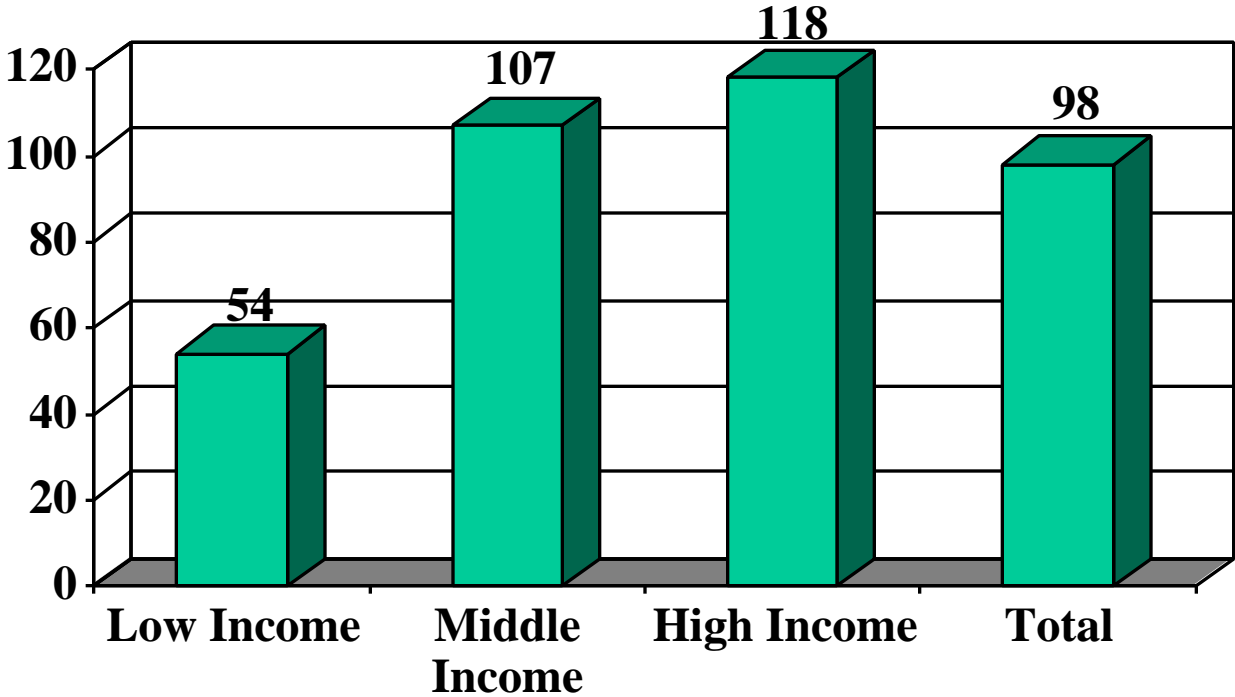
What Tech Coordinators Want



Average Per Student Technology Expenditures in 1998 by School Level



Average Per Student Technology Expenditures in 1998 by Community Income Level



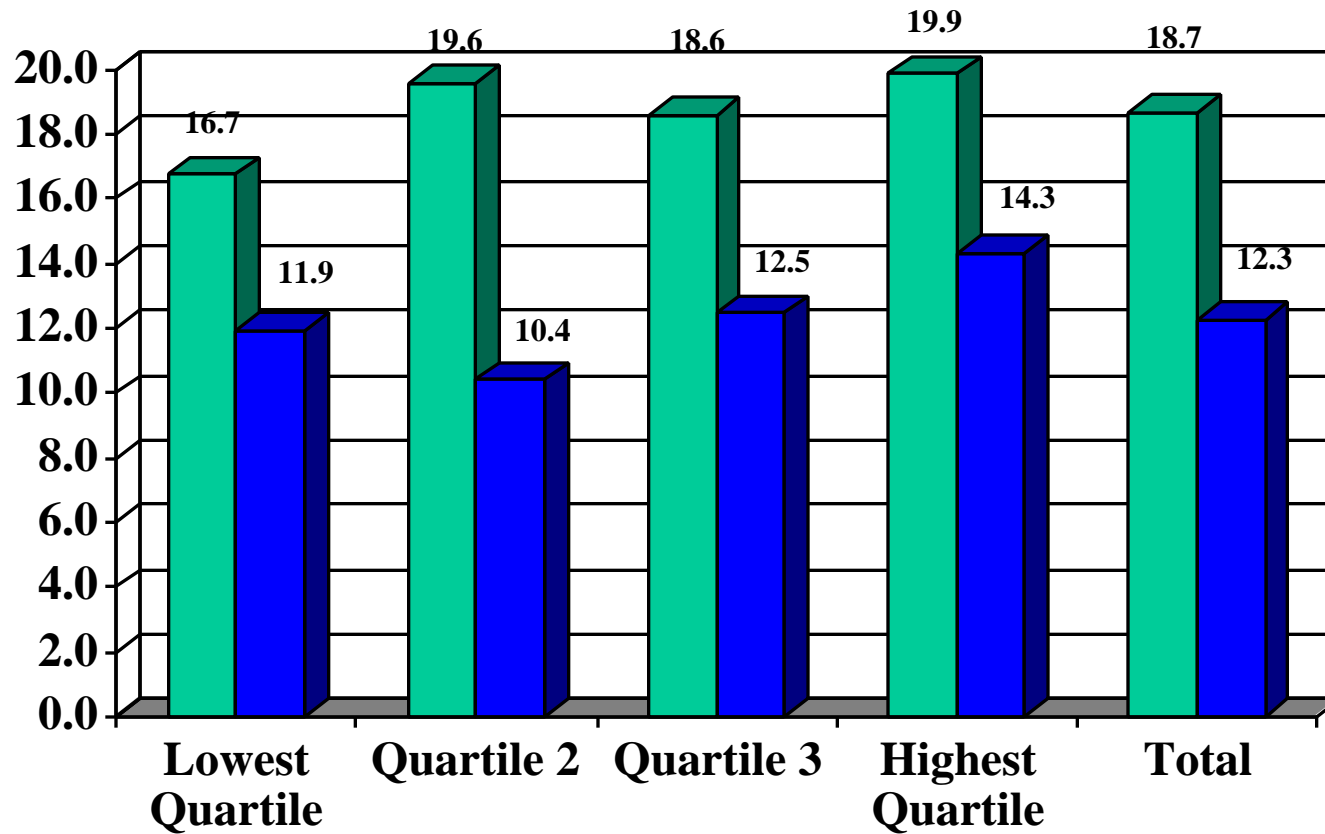
Technology Integrated Teaching Practices

Technology Coordinators were asked what proportion of the teachers did each of the following:

- Experiment with new teaching methods with computers
- Use computers for their own professional tasks
- Have students use computers to do curricular assignments
- Involved in implementing Internet-based activities
- Seek advice about integrating technology and curriculum

A summated scale was produced from these 5 responses

Technology Integrated Teaching and Internet Use Per Student Expenditure Levels



Technology Coordination and Support

Sara Dexter

Technology Coordinators(TCs)

AMPLIFIERS or CATALYSTS?

- 467 respondents
- Probability sample only

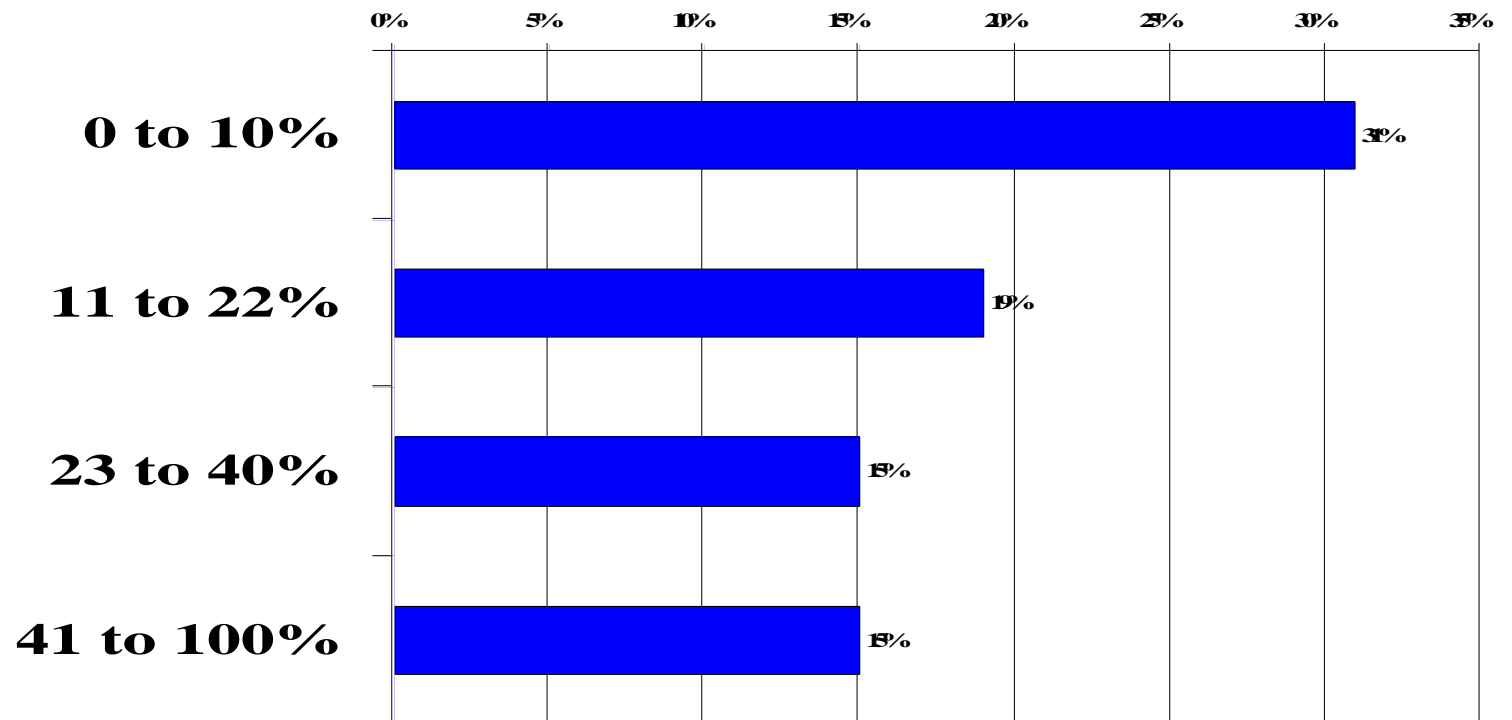
Who are TCs?

- Indicated roles:
 - Technology and/or Network coordinator ~25%
 - Technology and Instruction *Classroom* ~45%
 - Technology and Instruction *Media* ~16%
 - Other ~13%
- **20 % are fulltime** (>35 hrs/wk)
on various technical coordination tasks

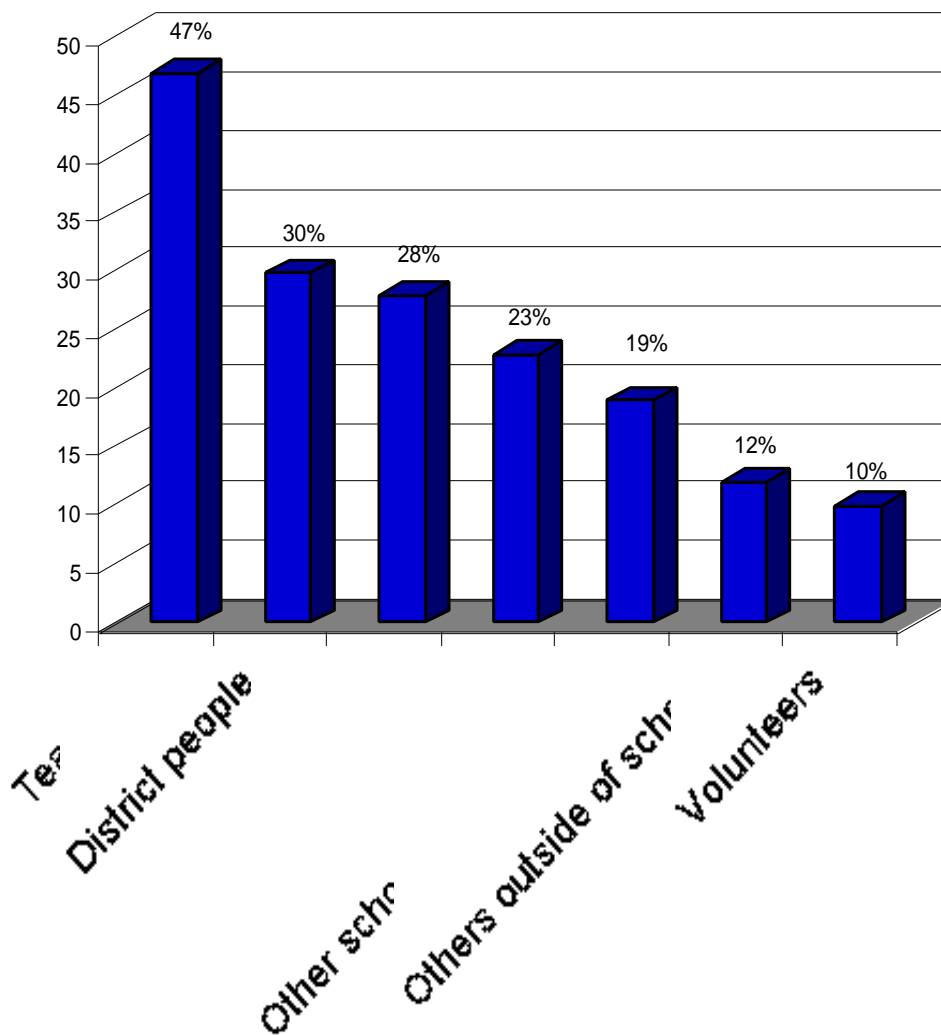
Schools with “full-time” TCs tend to be

- High schools
- Public
- Large
- High Income

Chap. 1 Eligible



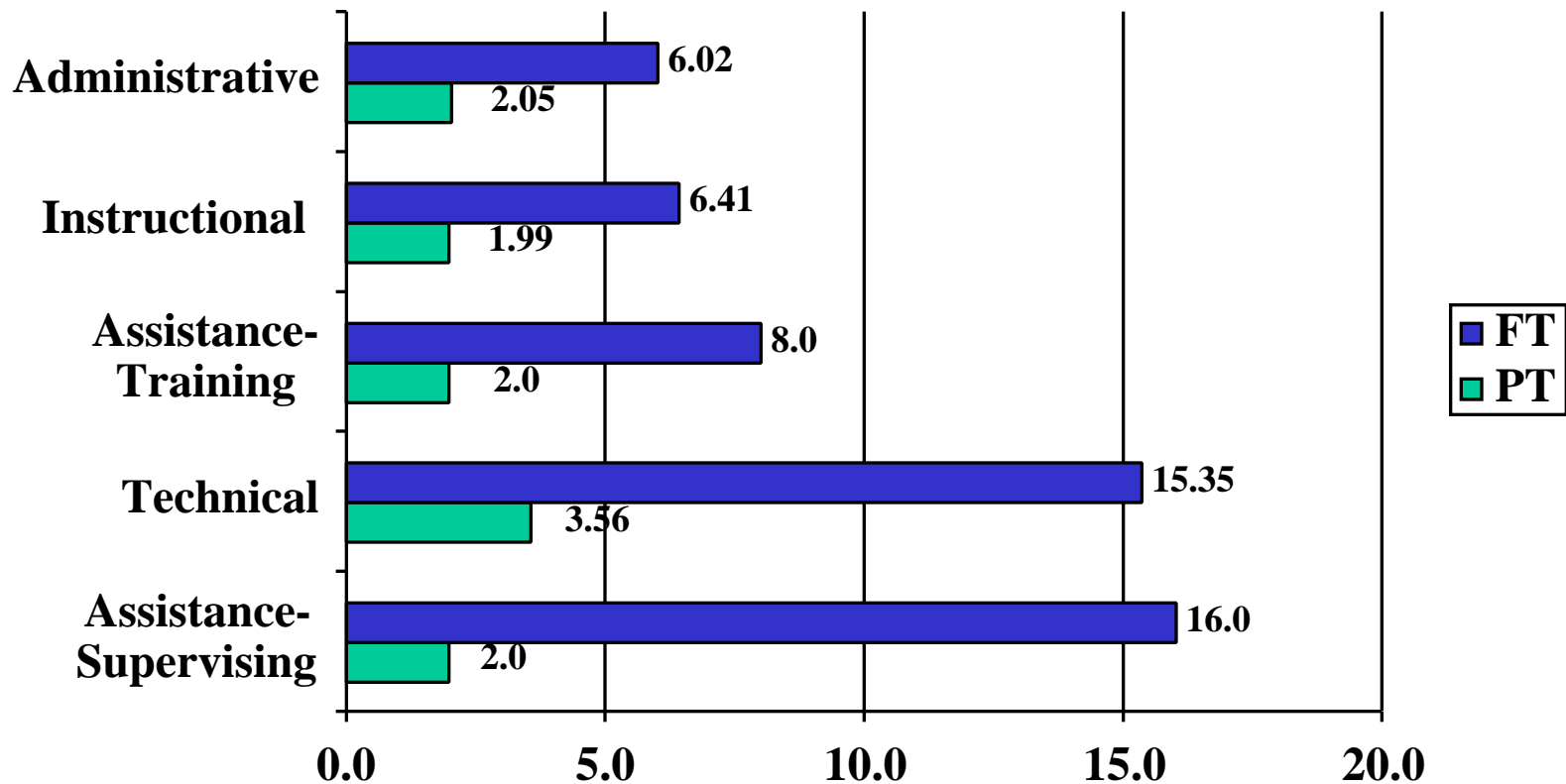
Who helps TCs?



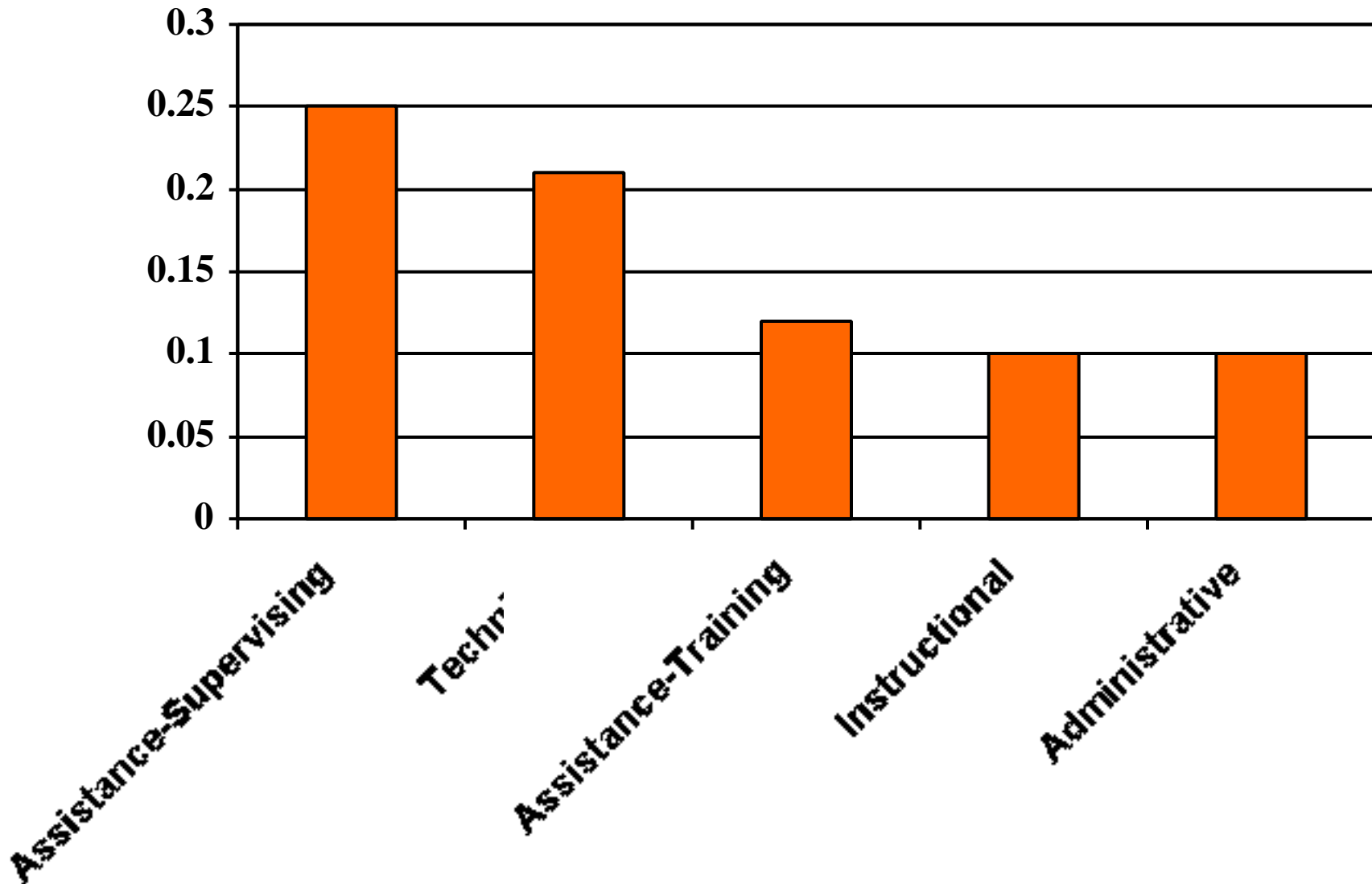
- 2 to 3 additional people
- 15 hours extra support
- Average annual total = ~540 hrs

- Teachers
- District People
- Aides
- Administrators

Total Weekly Hours Spent on Technology Tasks



Weekly Hours Spent on TC Tasks Per Teacher



Does Having Technology Coordination/Support Predict An Improved TLC School Climate?

	Full-time Coordinator	More Teacher Support Hours
Getting Computer Grants	no	no
Principal E-mails Teacher Admin	no	yes
More Internet Use by Teachers & Students	no	yes
Technology Integrated Teaching Practices	yes	yes

NOTE: findings based upon statistical controls for school type,
Community Income, and Organizational Supports.

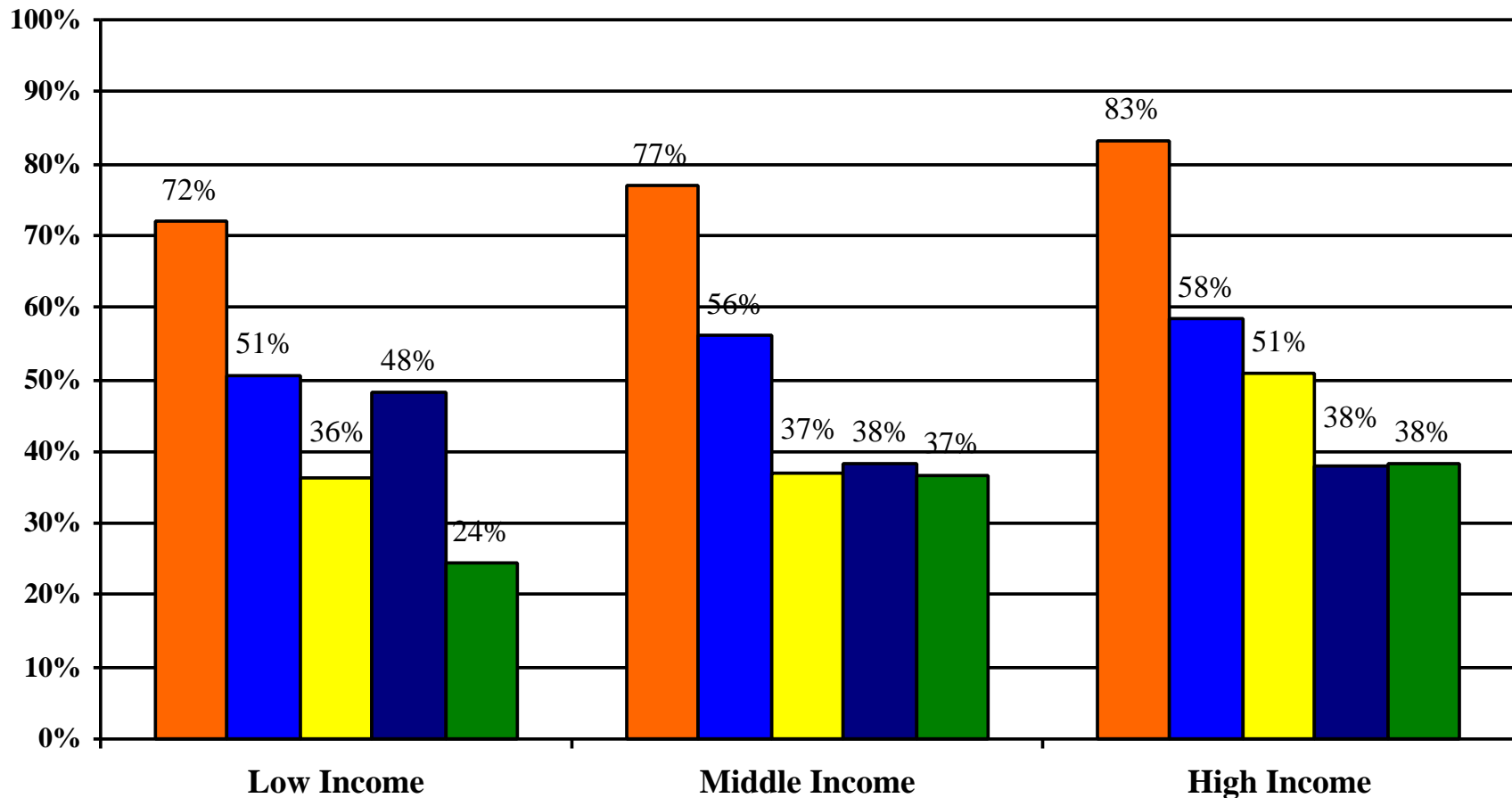
Organizational Support Structures and School Technology

Amy Ronnkvist

Organizational Support Structures For Technology Use

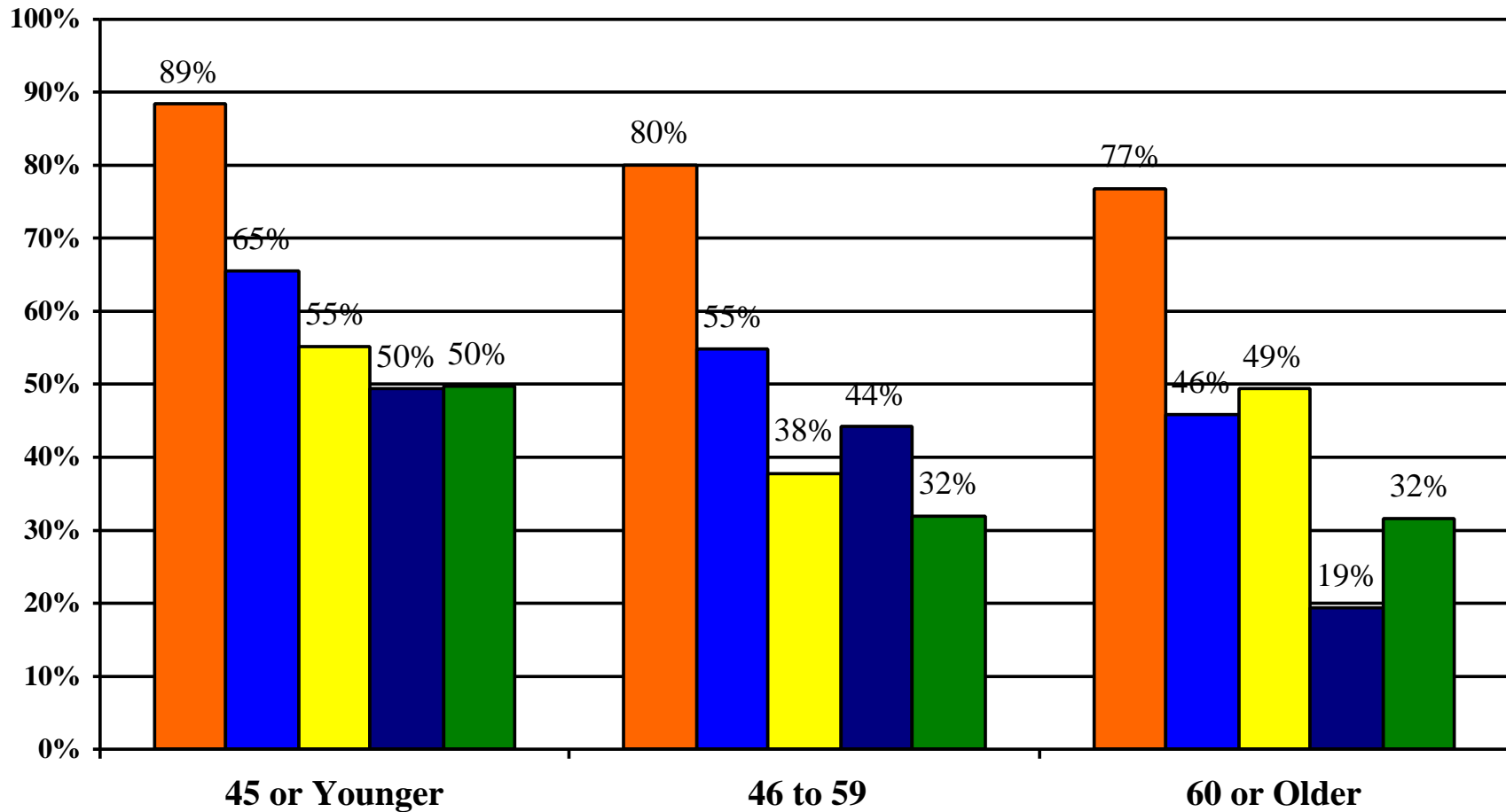
- Technology Committees (79%)
- Technology Budget (53%)
- Time Principals or Assistant Principals on Technology (42%)
- Teachers Take the Lead on Technology (37%)
- Districts/Dioceses Support Technology (33%)

Organizational Support Structures by SES



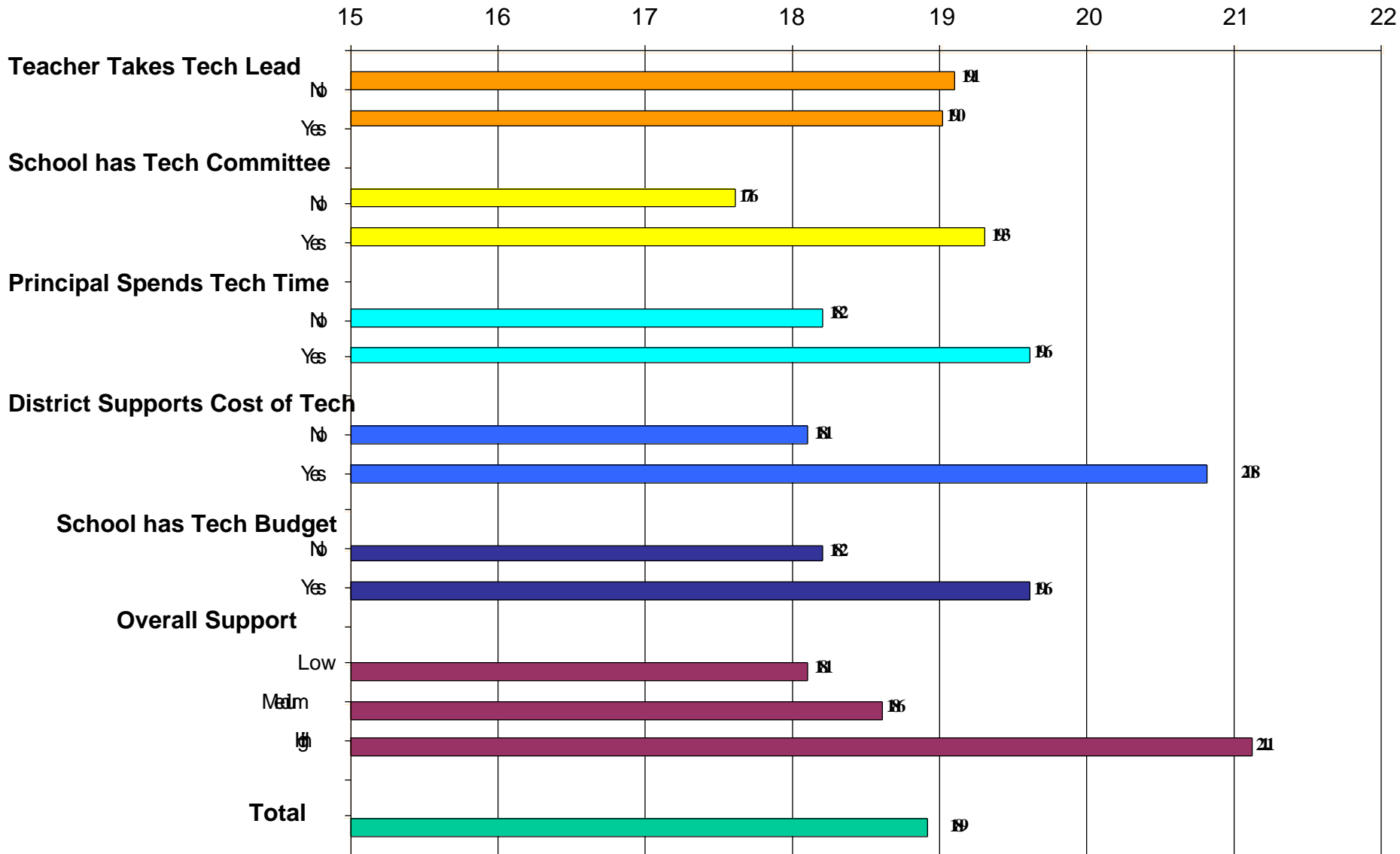
- School has Technology Committee
- School Has Technology Budget
- Principal/Assistant Principal Spends Technology Time
- Teacher Takes Technology Lead
- District Supports Cost Of Technology

Organizational Support Structures by Age of Principal



- School has Technology Committee
- School Has Technology Budget
- Principal/Assistant Principal Spends Technology Time
- Teacher Takes Technology Lead
- District Supports Cost Of Technology

Technology Integrated Teaching By Organizational Support Structures



Do Organizational Supports Predict Attributes of TLC School Climate?

	Organizational Support Structures	Reform-Recognized School	High-Technology School
Getting Computer Grants	yes	no	no
Principal E-mails Teachers & Admin	yes	no	yes
More Internet use by Teachers & Students	yes	no	yes
Technology Integrated Teaching Practices	yes	yes	yes

NOTE: findings based upon statistical controls for school type, Community income, and presence of technology coordinator.

Report Series Available on Web & Hard Copy

- *Internet Use by Teachers (available now)*
- *Computer Presence in American Schools (available now)*
- *Computer and Software Use by Teachers*
- *School Decision-Making on Technology*
- *Staff Development & School Support for Teachers' Computer Use*
- *Pedagogical Beliefs and Practices Among American Teachers*
- *School Technology Investment Alternatives*
- *Teacher Pedagogy and their Use of Computers*
- *School Context and Personal Factors in Teachers' Use of Computers*
- *Computer Use in Reform and High-End Technology Settings*
- *Dynamic Relationships Between Pedagogy and Computer Use*
- *A Summary of Teaching, Learning, & Computing-1998*

For More Information visit our Research Project Web Site:

www.crito.uci.edu/TLC

- New findings presented weekly
- Discussion group
- Reports and newsletters: view or download
- Archive of previous newsletters and findings

Response Panel

Teaching, Learning & Computing 1998



Chris Dede
Beverly Hunter
Arthur Leuhrmann
Bob Tinker

HERE: After the Break

[Http://www.crito.uci.edu/TLC](http://www.crito.uci.edu/TLC)