

# Teacher Leaders and Leading-Edge Computer- Users: Are they the SAME?

Hank Becker • Margaret Riel • Kim Burge • Yani Wong  
University of California, Irvine

Ron Anderson • Sara Dexter  
University of Minnesota

# Larry Cuban: “Computers are Oversold and Underused”

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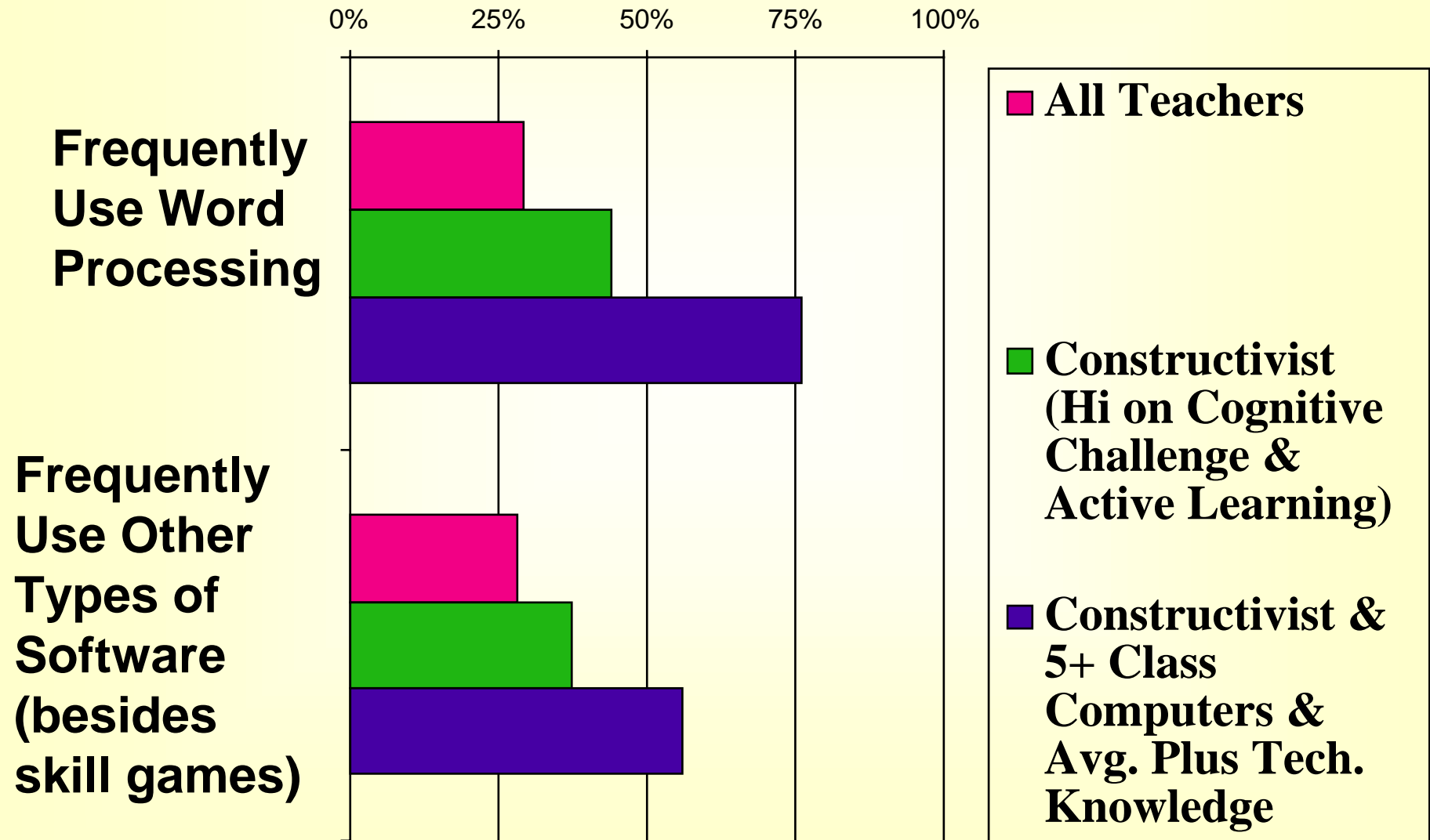
- Teacher responsibilities are so great and computers are so hard to use:
- It is a mismatch between  
Teacher Needs and Technology Affordances
- Administrators distribute; teachers ignore  
(& besides, often computers are too inconvenient to use)

# This View Is Not So Easily Dismissed

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- **Inconvenient Access to Computers**
  - Typical classroom has only 1 or 2 computers
    - Despite more Web connections, too few computers
- **50 minute Secondary School Schedule**
  - Most intensive computer experiences are outside of academic classes
- **Pressures for Curriculum Coverage**
  - “Coverage” and test preparation are teachers’ two most widely felt pressures
  - Few secondary academic teachers use computers extensively with their students
    - In 1998... 1/4 of English teachers, 1/6 of science teachers, 1/8 of social studies, 1/9 of math
- **Teachers’ computer use is strongly affected by their teaching philosophies**
  - Many teachers accept a skills- and fact-orientation to their subject.
    - Those who do are much less likely to use computers with their students
- **Most teachers use computers themselves, but many lack technical expertise**
  - Takes time to learn. But time is precious!

# However, When Conditions are Right, Teachers' Students Use Computers Frequently



# Constructivist Pedagogy

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*Teachers Having Students Involved In Cognitively Challenging Activities*

**Reflective Writing:** Journals, Essays, Self-assessments

**Other Meaningful Tasks:** Making conjectures, addressing questions that the teacher can't answer; student-led discussions or presentations; sharing ideas or opinions, justifying or explaining their reasoning; relating work to their own experience; arguing different points of view; representing idea in multiple ways; etc

**Problem-Solving:** Problems with no obvious method of solution; designing their own problems to solve; deciding own procedures for complex problems and discussing results.

*Also: Students Engaged in Active Learning*

**Group work:** Discussions to start unit; to complete assignments as a team; joint solution to problems

**Projects:** Taking a week or more; hands-on/lab activities; making a product for use by others; demonstrating work to people other than from family or school.

**Limited Use of Traditional Pedagogy:** Introductory drills on skills and facts; teacher-led whole-class discussions for extended periods of time; asking to see if students know the "correct" answer; having students work individually on textbook or worksheet problems.

# How Will Most Teachers Become Effective Uses of Technology?

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- **Top-Down?** Standards, accountability?
- **Bottom-Up?** Peer leadership?  
But...
- **Will Teacher-Leaders provide Technology Leadership?** How Do Teacher Leaders Stand on Technology?
- **Will Technology Leaders provide Instructional Leadership?**  
Are Leading-Edge Technology-Using Teachers Instructional Leaders As Well?
- **The Teaching, Learning, & Computing National Survey (TLC)** Helps to Answer Those Questions

# The Study Sample

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- A representative sample of all U.S. schools  
(Probability Sample: 655 schools participated)
- Plus schools selected for a reason (Purposive Sample)
  - 378 schools participating from 52 major reform programs including
    - Schoolwide reform programs emphasizing technology
    - Programs that recruit individual teachers as participants
  - 182 schools with high-end technology, some designing their own reforms around technology
- Three-quarters of sampled schools participated in the study, carried out in Spring, 1998
- Over 4,100 teachers from grades 4-12 participated, nearly 70% of those sampled.
  - 3 to 7 teachers in any one school
  - Completed 20 page questionnaires

# Statistical Profiles of Four Groups of Teachers

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- Teacher-Leaders (176)
  - Who Are They?
  - What Are Their Pedagogies?
  - How Do They Use Computers in Their Teaching?
- Highly-Active Technology-Using Teacher-Participants in Reform Programs (78)
- High-Tech Teachers in High-Tech Schools (54)
- Strong Users of Student Multi-Media Publishing Teaching Strategies (151)
  - Who are they?
  - What are their pedagogies?
  - What's their teaching environment?
  - Are They Teacher-Leaders?

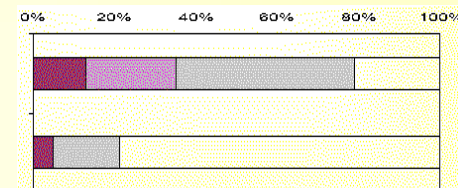
# Professional Engagement and Constructivist Computer-Use

**Margaret Riel,  
University of California, Irvine**

# Determining Level of Professional Engagement U.S. Teachers

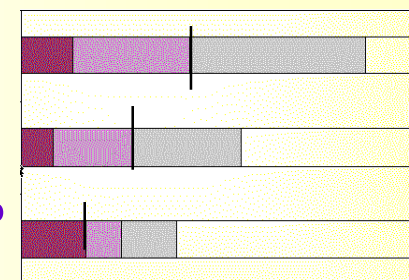
## 1. Teacher Conversations at School about: Average Score

Teaching, Learning, Assessment (4) -- Daily 13%  
 Classroom Visits to Observe Teaching (2) -- weekly+ ~5%



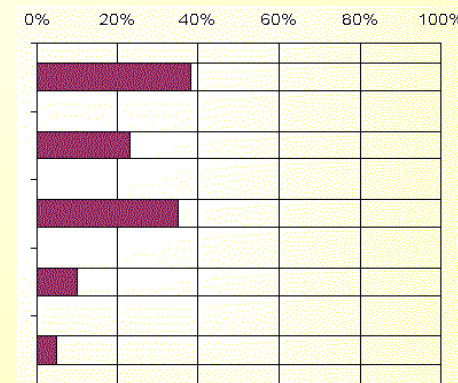
## 2. Teacher Interactions Beyond the School: 2 Leaders or 1 Prof.

Attends Workshops -- monthly+ 13%  
 Participates on Committees -- monthly+ 8%  
 Professional exchanges through E-mail -- monthly+ 16%

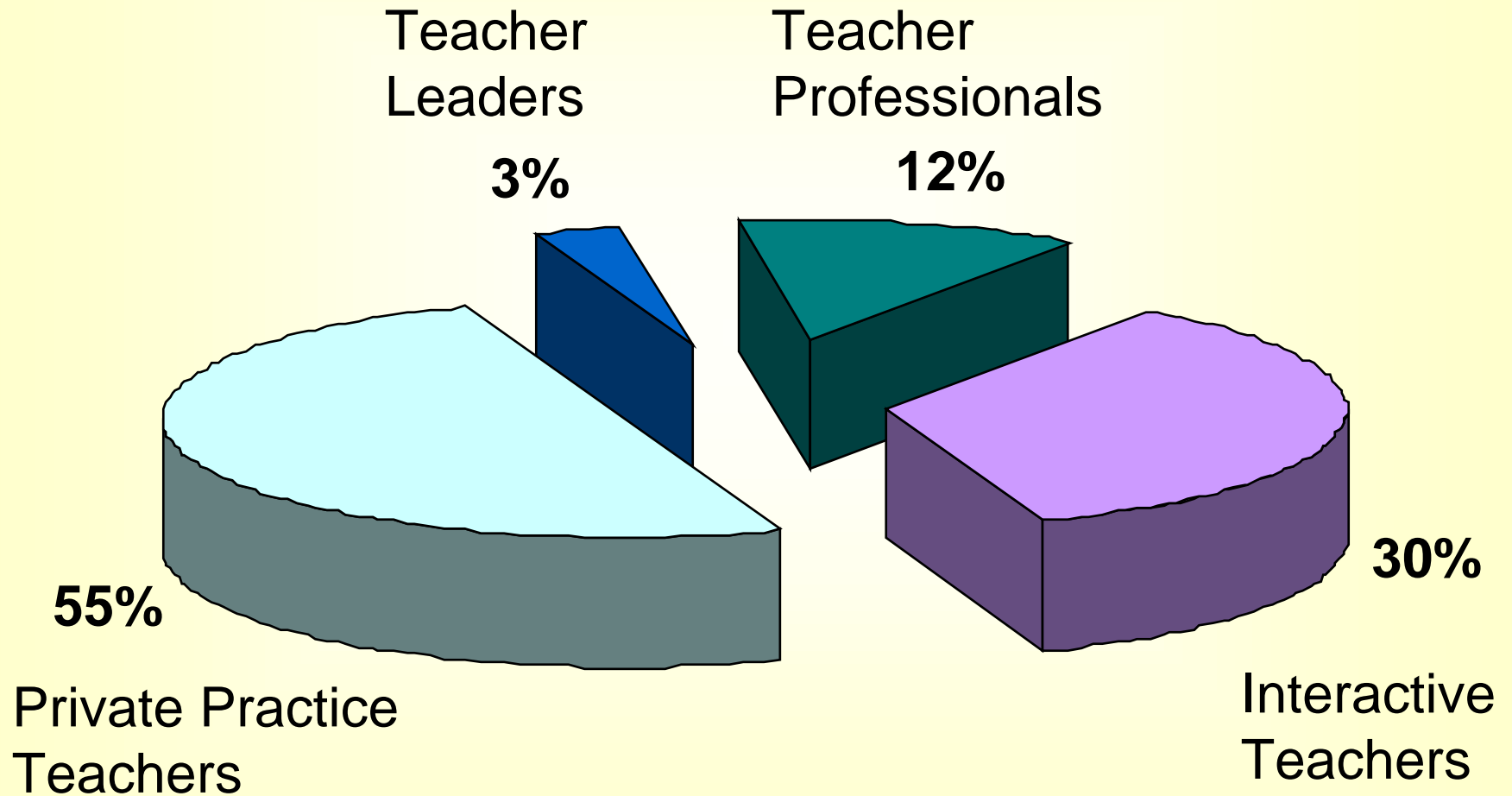


## 3. Leadership Activities over Past 3 Years: 3 Leaders; 2 Profes.

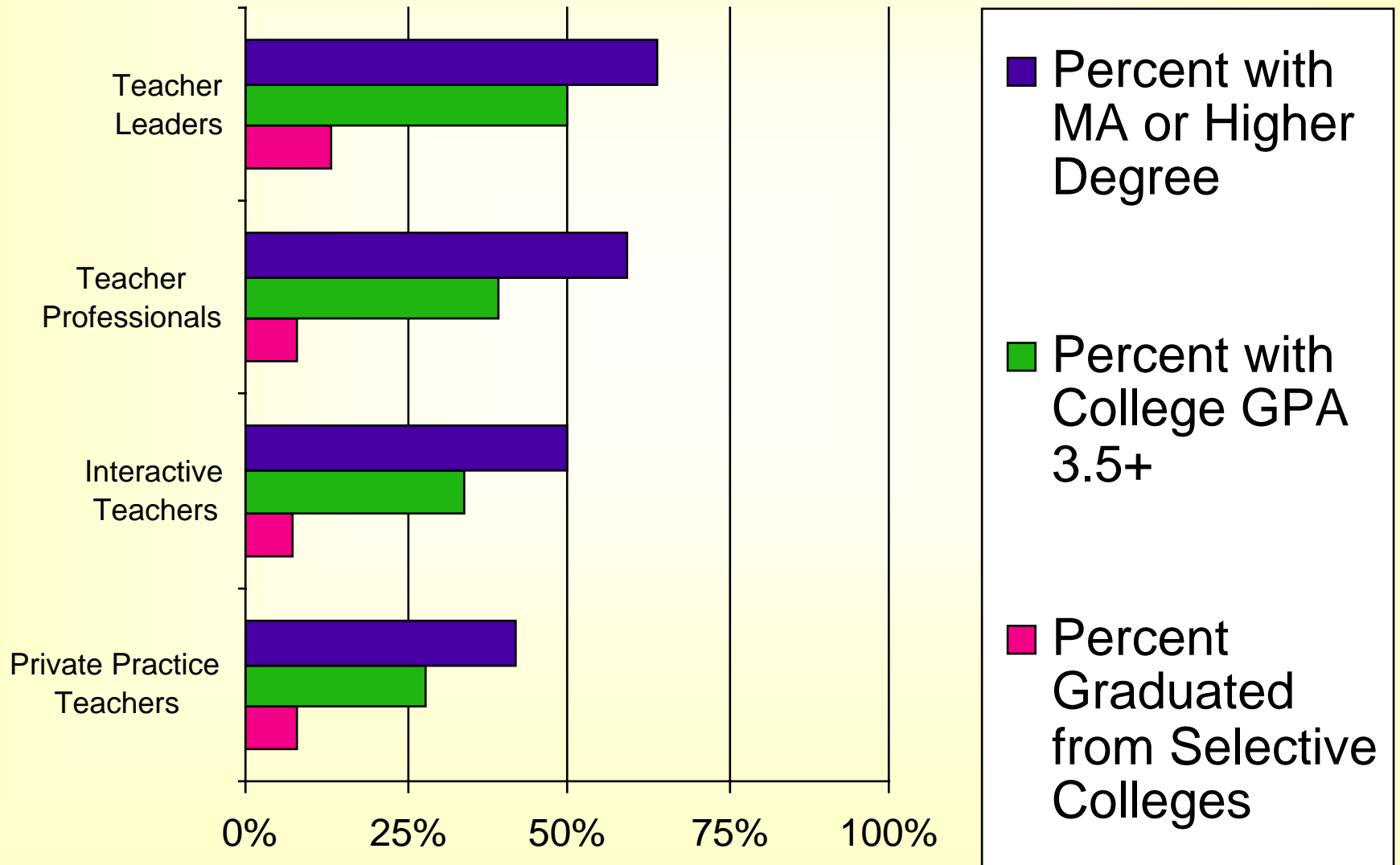
Informally Mentored a Teacher -- Yes 38%  
 Formally Mentored a Teacher -- Yes 23%  
 Teaching Peers in Workshop/Conf. -- Yes 35%  
 College Teaching -- Yes 10%  
 Publishing Articles in Ed. -- Yes 5%



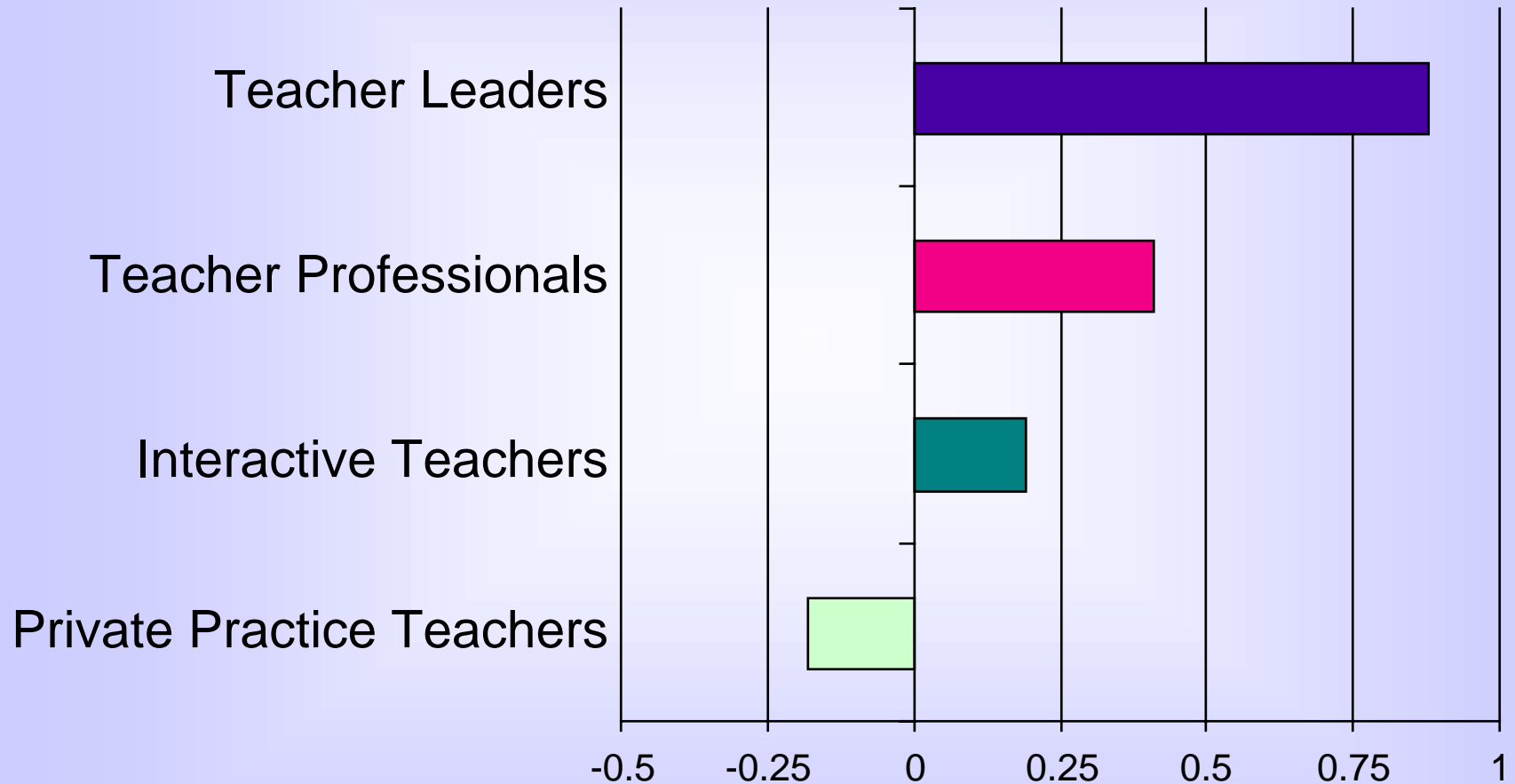
# Levels of Professional Engagement



# Educational Background by Level of Professional Engagement



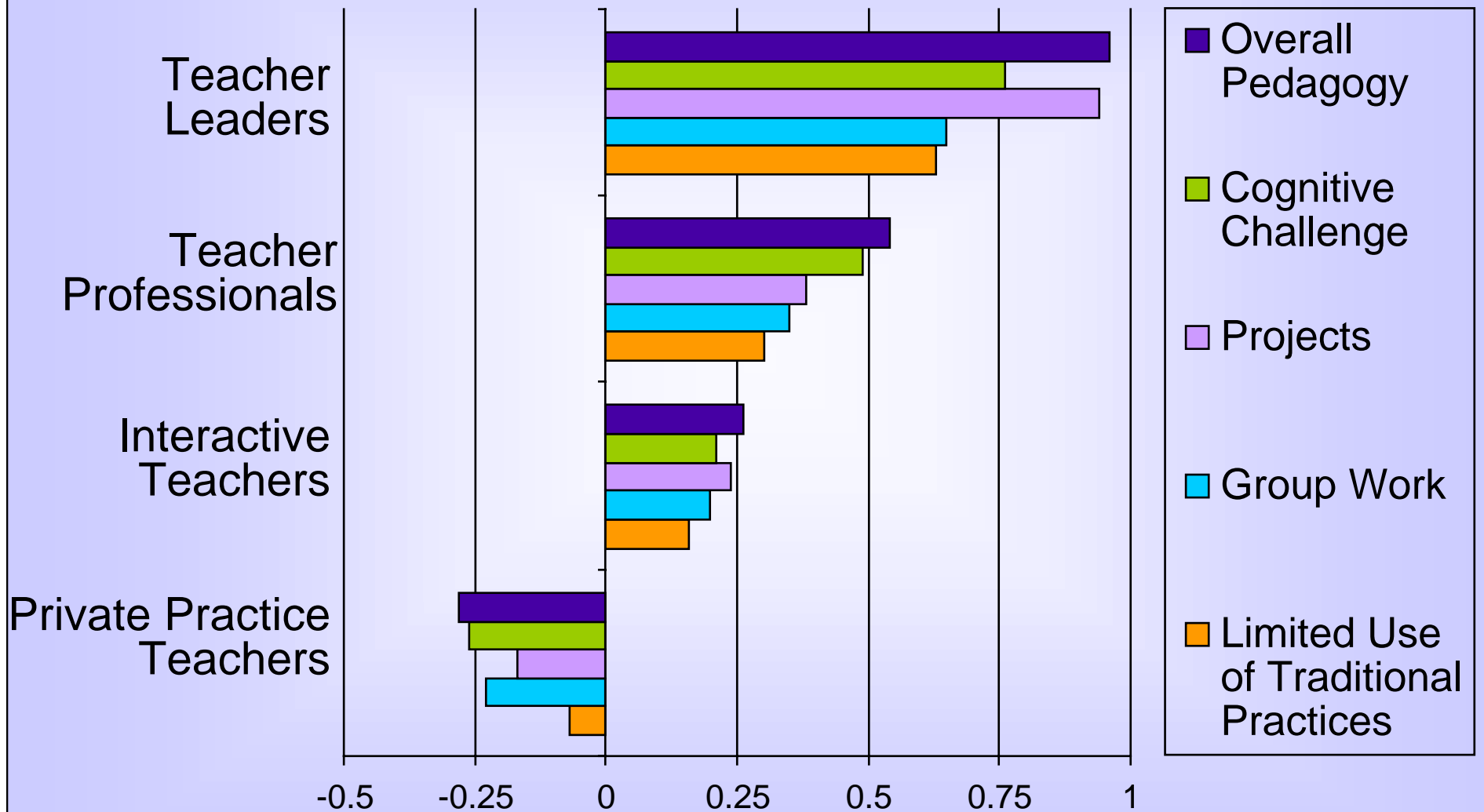
# Constructivism of Teaching Philosophy by Level of Professional Engagement



Universe: Probability and purposive samples.

Note: Values in graph are zscores.

# Constructivism of Teaching Pedagogy (incl. subscales) by Level of Professional Engagement



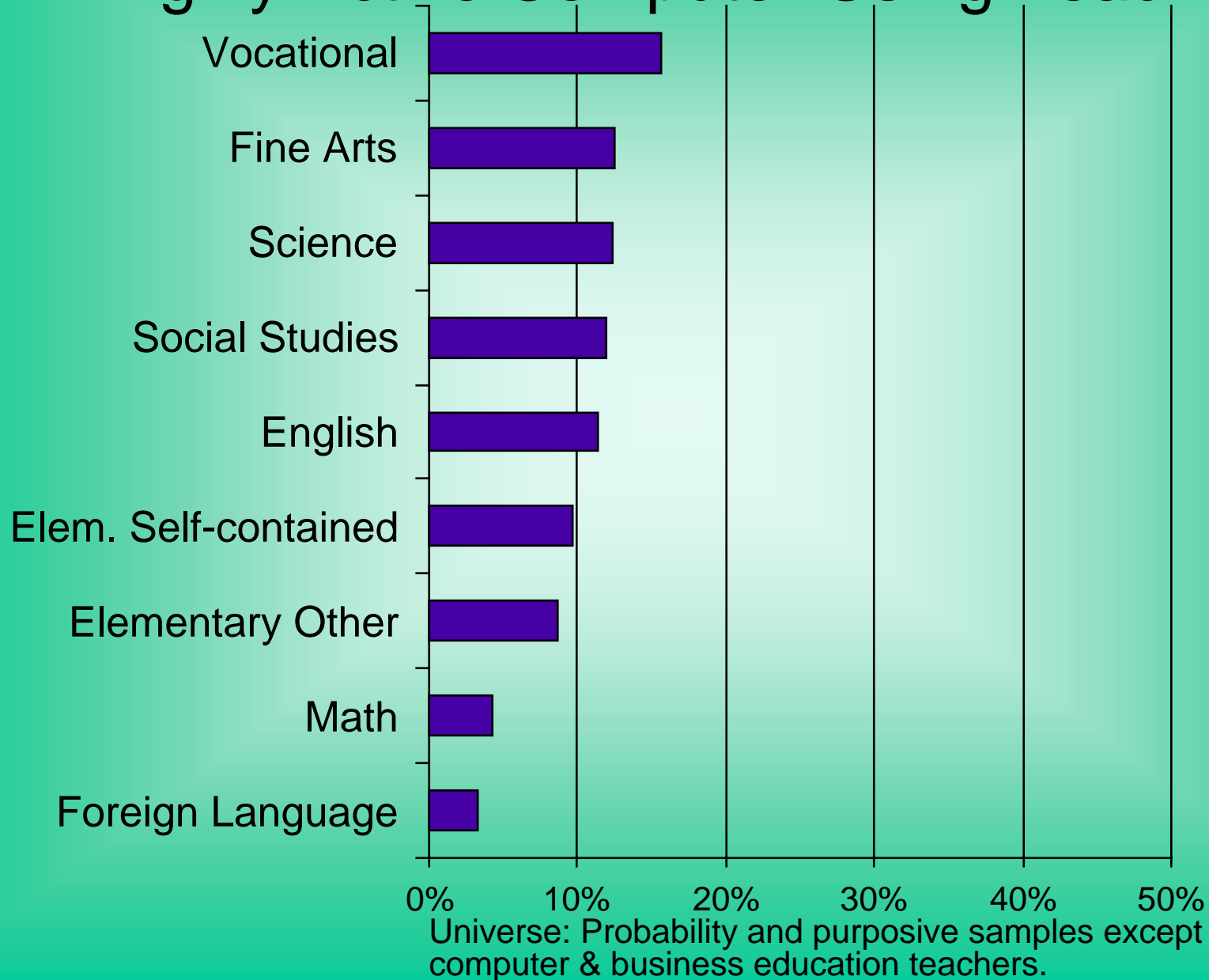
Universe: Probability and purposive samples.  
Note: Values in graph are zscores.

# Highly Active Computer Users

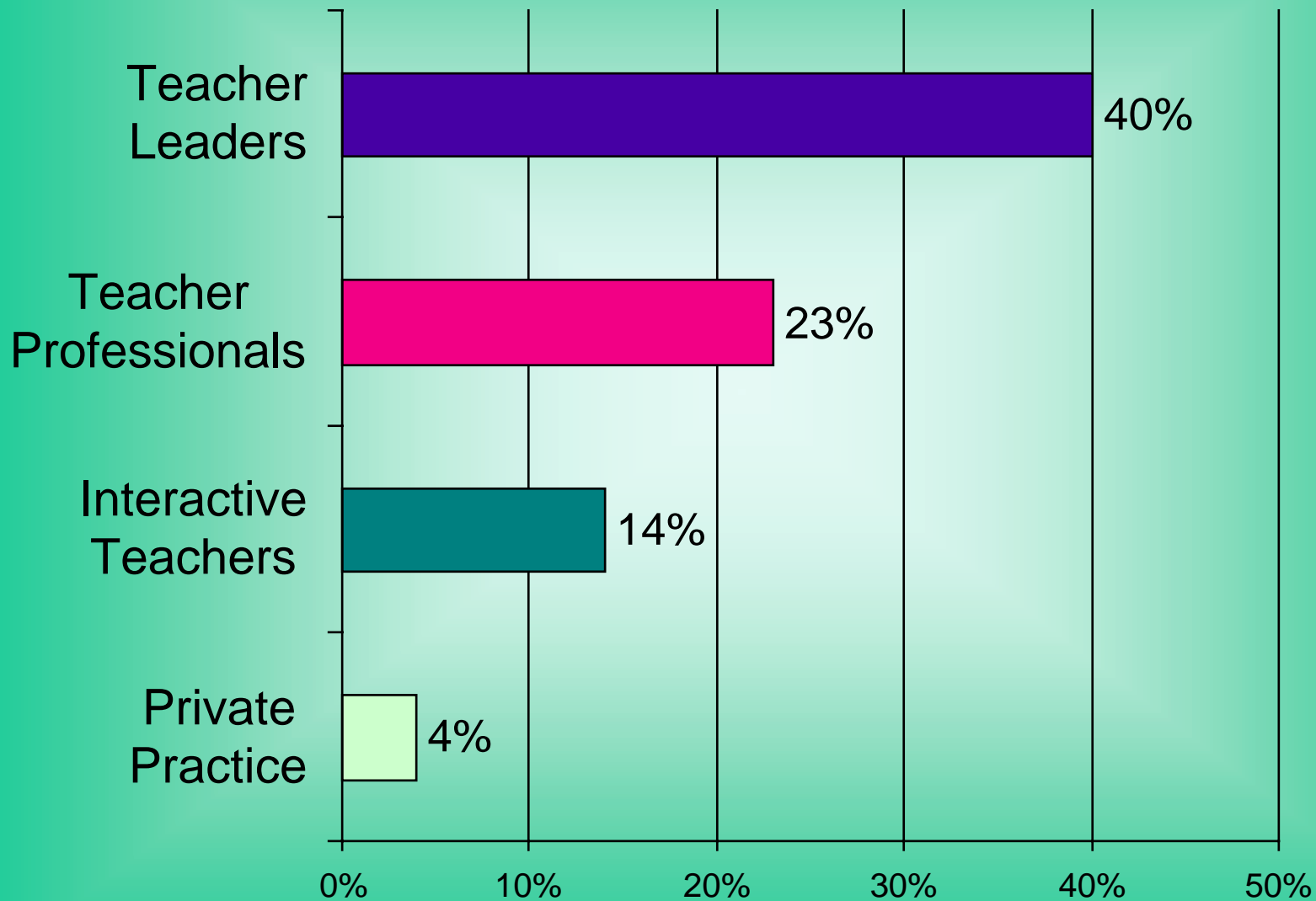
- Frequent Use of a Variety of “Tool” Software by Students
- Strong Teacher Professional Use of Computers
- Reasonably High Teacher Computer Expertise
- Access to Many Computer Resources- Classroom and Teacher’s Home
- Substantially Increased Use of Computers over Past 5 Years.

10 Percent of All Teachers Met Our Conditions

# Percent of All Teachers Classed as Highly Active Computer-Using Teachers

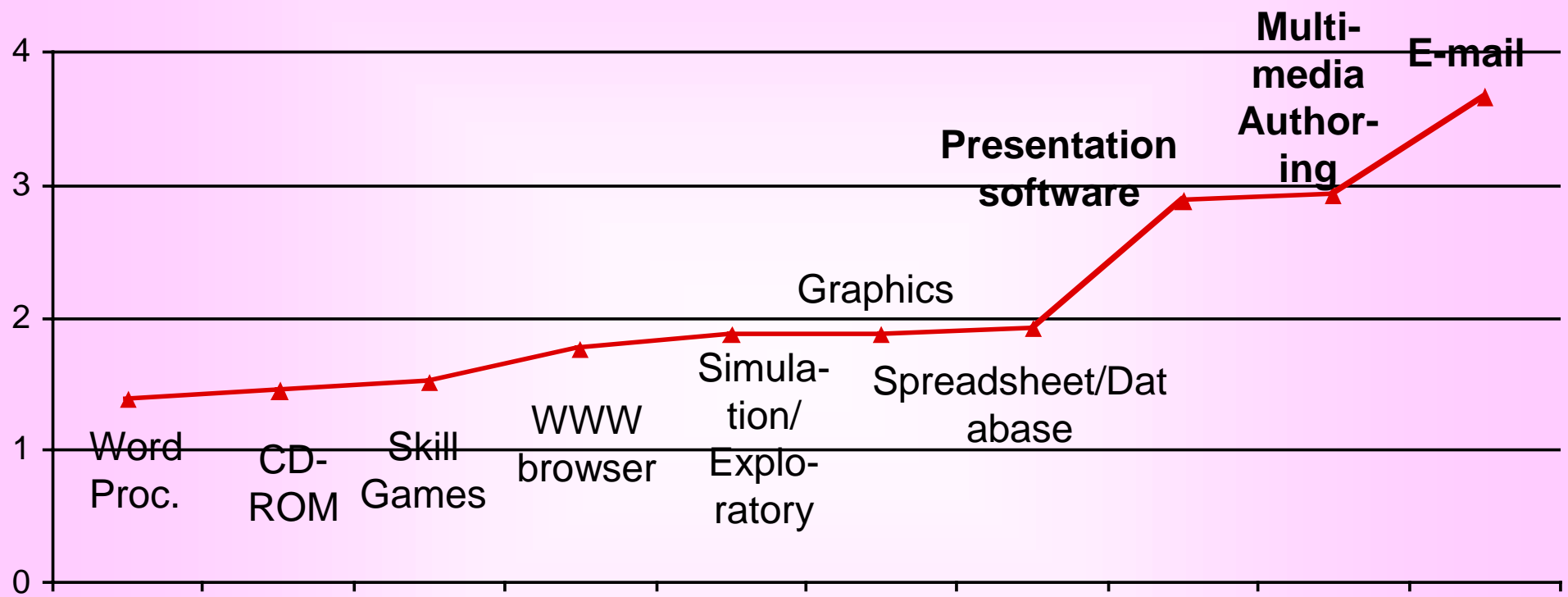


# Percent Highly Active Computer-Using Teachers, By Level of Professional Engagement



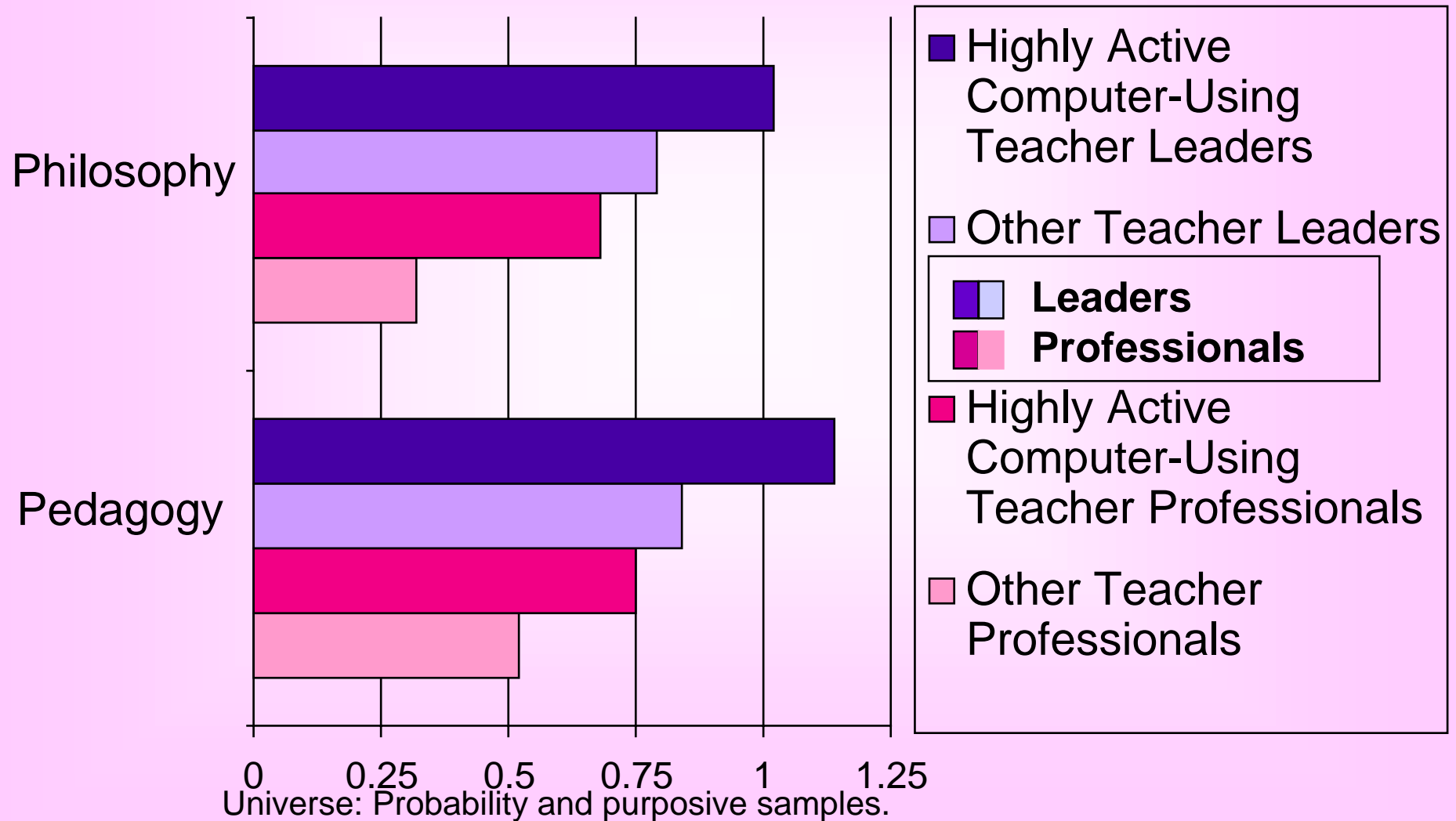
Universe: Probability and purposive samples except computer and business teachers.

# Professionally Engaged Teachers Use Different Software than Private Practice Teachers Do



Note: Probability and purposive samples.

# The Highly Active Computer-Users Among Professionally Engaged Teachers are the Most Constructivist of All



0 0.25 0.5 0.75 1 1.25  
Universe: Probability and purposive samples.

Note: Values in graph are within-subject matter zscores.

# Summary

Teachers who assume a professional orientation to teaching are far more likely to:

- (1) have made higher investments in their own education,
- (2) have constructivist-compatible philosophical beliefs about education,
- (3) develop the instructional practices with technology that are theoretically tied to their philosophy
- (4) integrate computers into their classrooms in ways that support meaningful thinking and involving working and sharing ideas with their peers.

# Implications

- Expert Students make Expert Teachers
- The voice of experience Defines Teaching and Learning as Co-Construction
- Teacher Leaders Learn to Use Technology
- Closed Classroom Doors Open Concerns about the Quality of Teaching



## 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



# Highly-Active Technology-Using Teacher-Participants in Reforms

Yani Wong  
University of California, Irvine

# Defining the Teacher Sample of Interest

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- They participate in a program of instructional reform that is any of these
  - **A formal schoolwide reform program with computer technology as a salient feature** (e.g., Co-NECT schools)
    - 94 teachers from 26 schools
  - **A formal reform program that recruits individual teachers** (e.g., Global Lab)
    - 42 teachers from 42 schools
  - **A technology-oriented “program” developed at a single school with features of inquiry, constructivism, etc.**
    - 161 teachers from 48 schools
  - **A technology-oriented program developed by a single teacher at one school with features of inquiry, constructivism**
    - 7 teachers from 7 schools

# Defining the Teacher Sample of Interest, Part II

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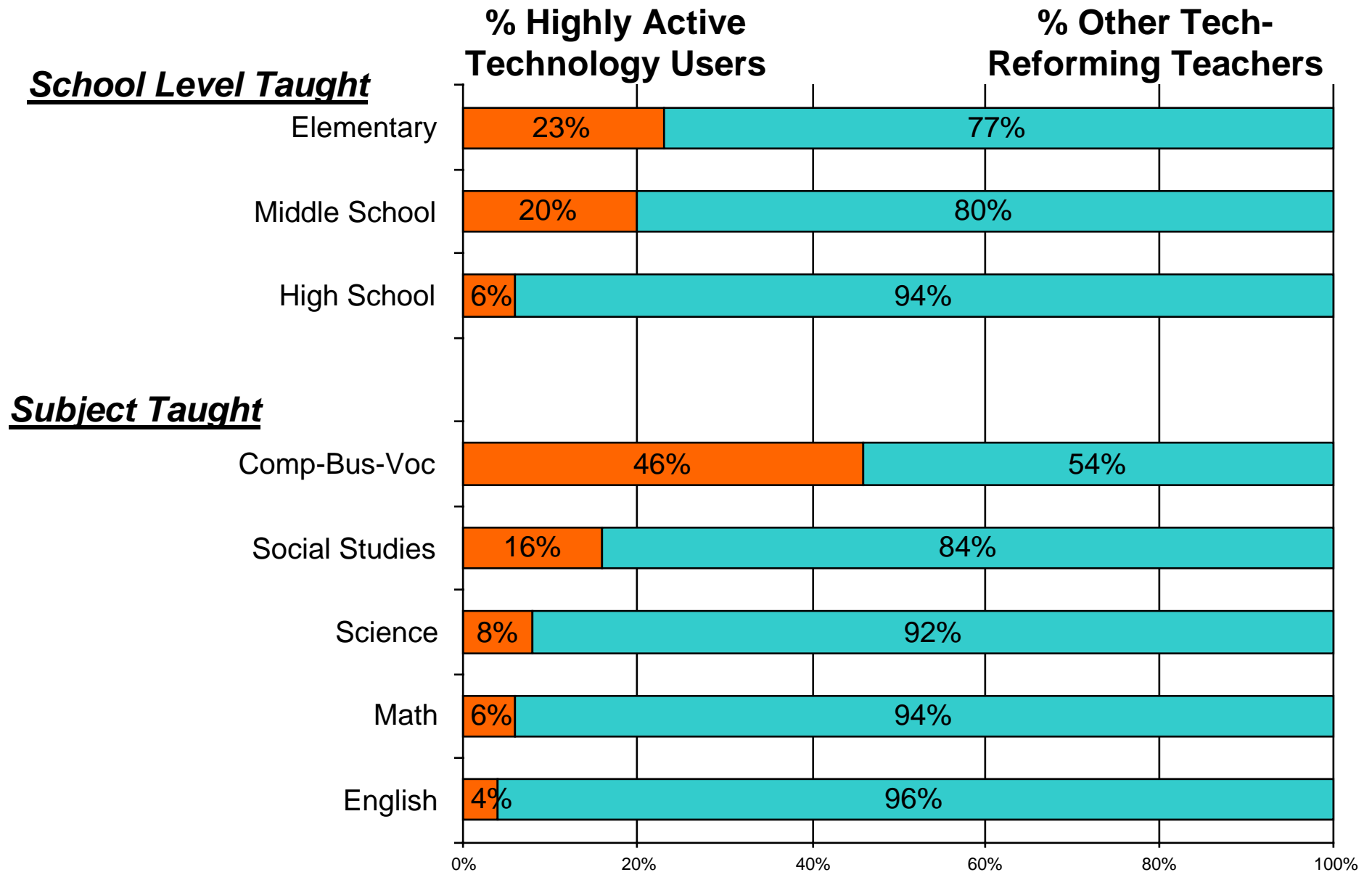
- AND they meet the requirement of being a Highly Active Computer User--e.g.,
  - Substantial use of tool software with students
  - Above average technical expertise
  - At least moderate frequent use by students of computers for common purposes like word processing
- 78 teachers in all
  - compared to 226 teacher participants in reform programs who weren't as active in computer use

# Programs They Represent

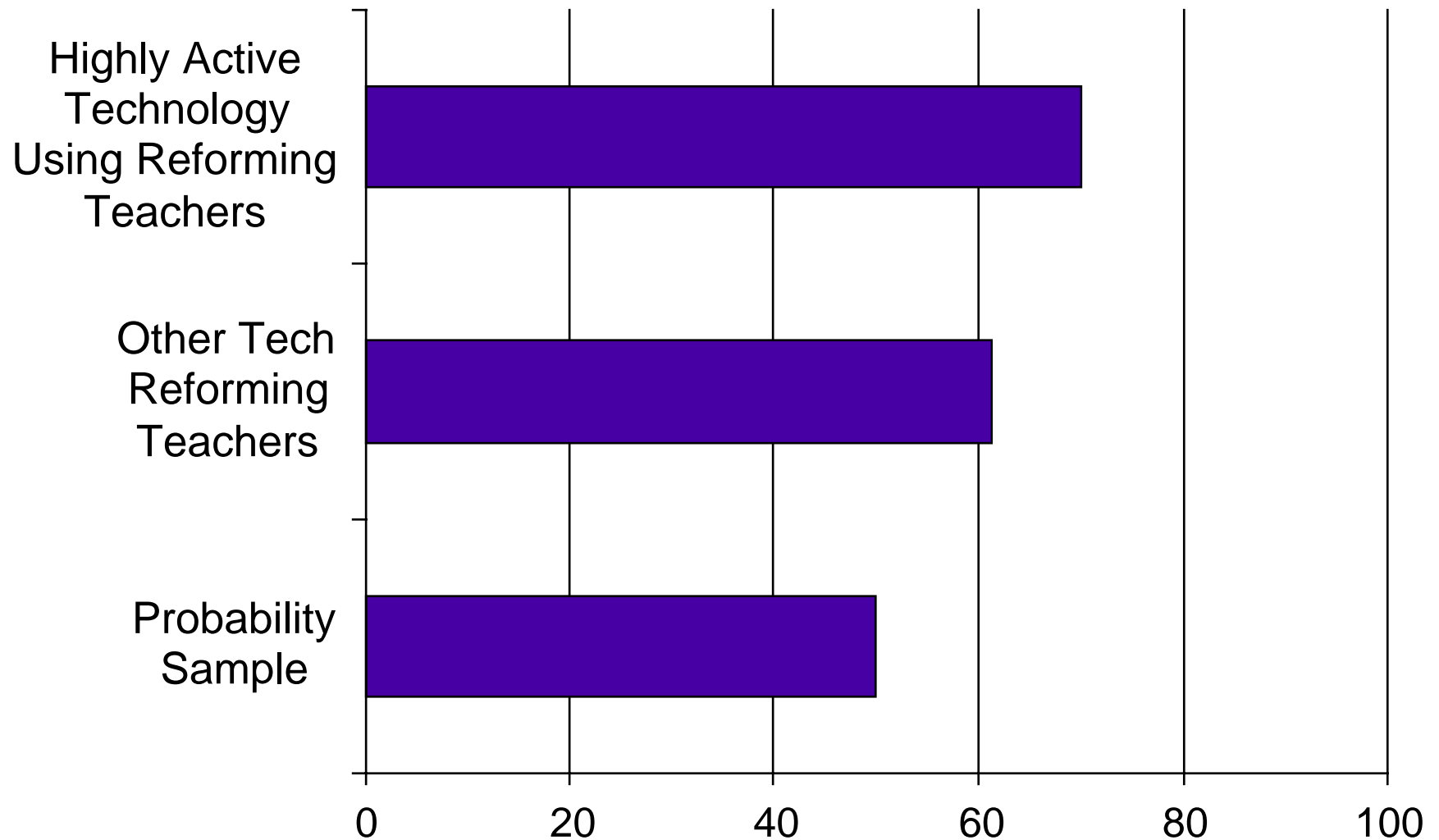
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- **National School Network:** 300 of the first schools with LAN-based high-speed direct Internet connections assisted by a network of support organizations and informal community
- **Co-NECT Schools:** Only one of the 9 “break-the-mold” schoolwide reform programs initially funded by the New American Schools that featured use of technology for whole-school change. Strong emphasis on project-based learning.
- **Schools for Thought:** Curriculum innovations based on cognitively based research on learning. Emphasizes importance of deep disciplinary knowledge, authentic problems, of feedback and reflection.
- **Learning Circles, Kids as Global Scientists, Global Lab,...**
- Schools identified in **White House Panel** on Educational Technology report as exemplars.
- Reform implementations reported in **Technology and Learning** magazine.
- Schools with early strong student-presence on Web (**Web66** database)

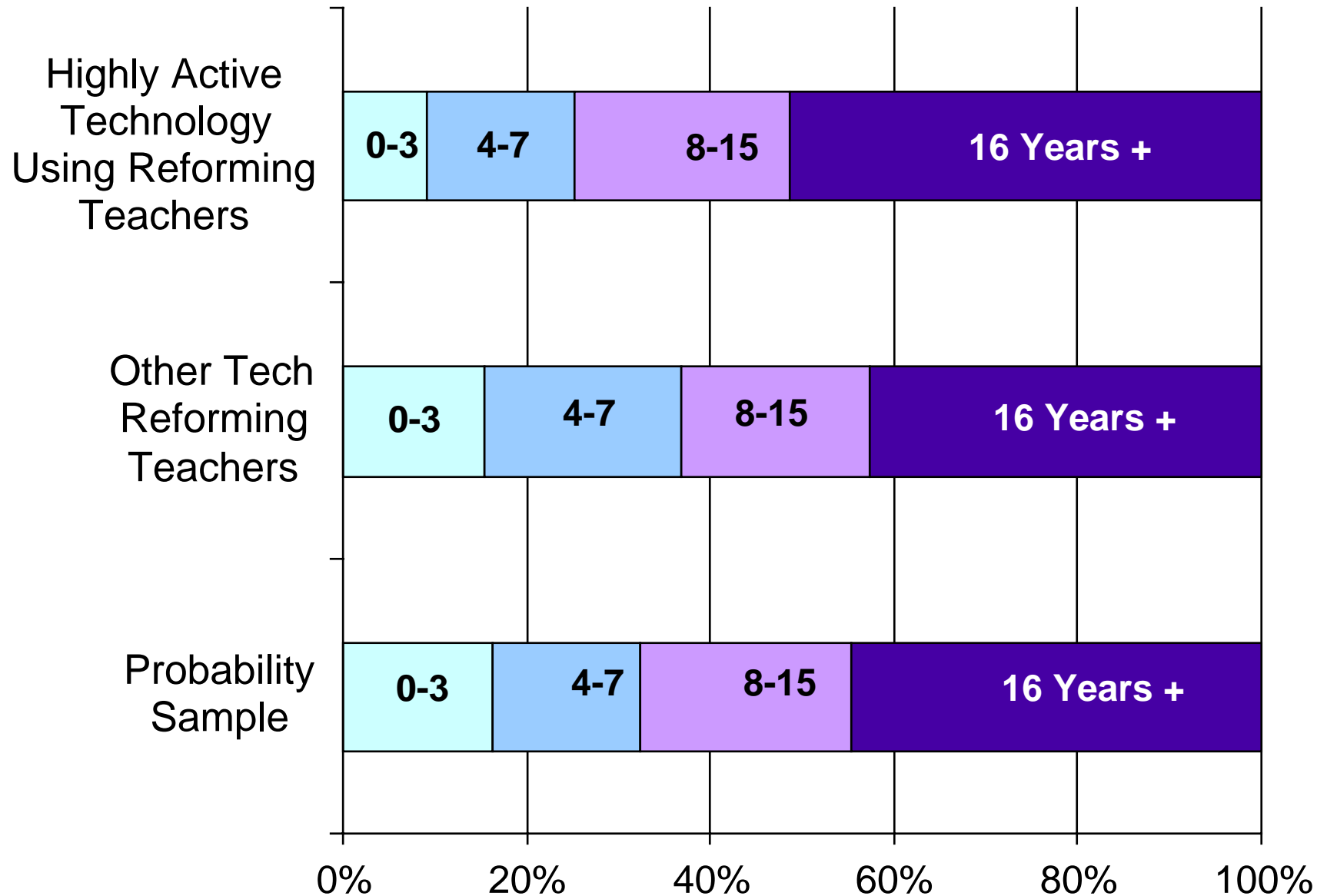
# Highly Active Technology Using Reforming Teachers - Who Are They?



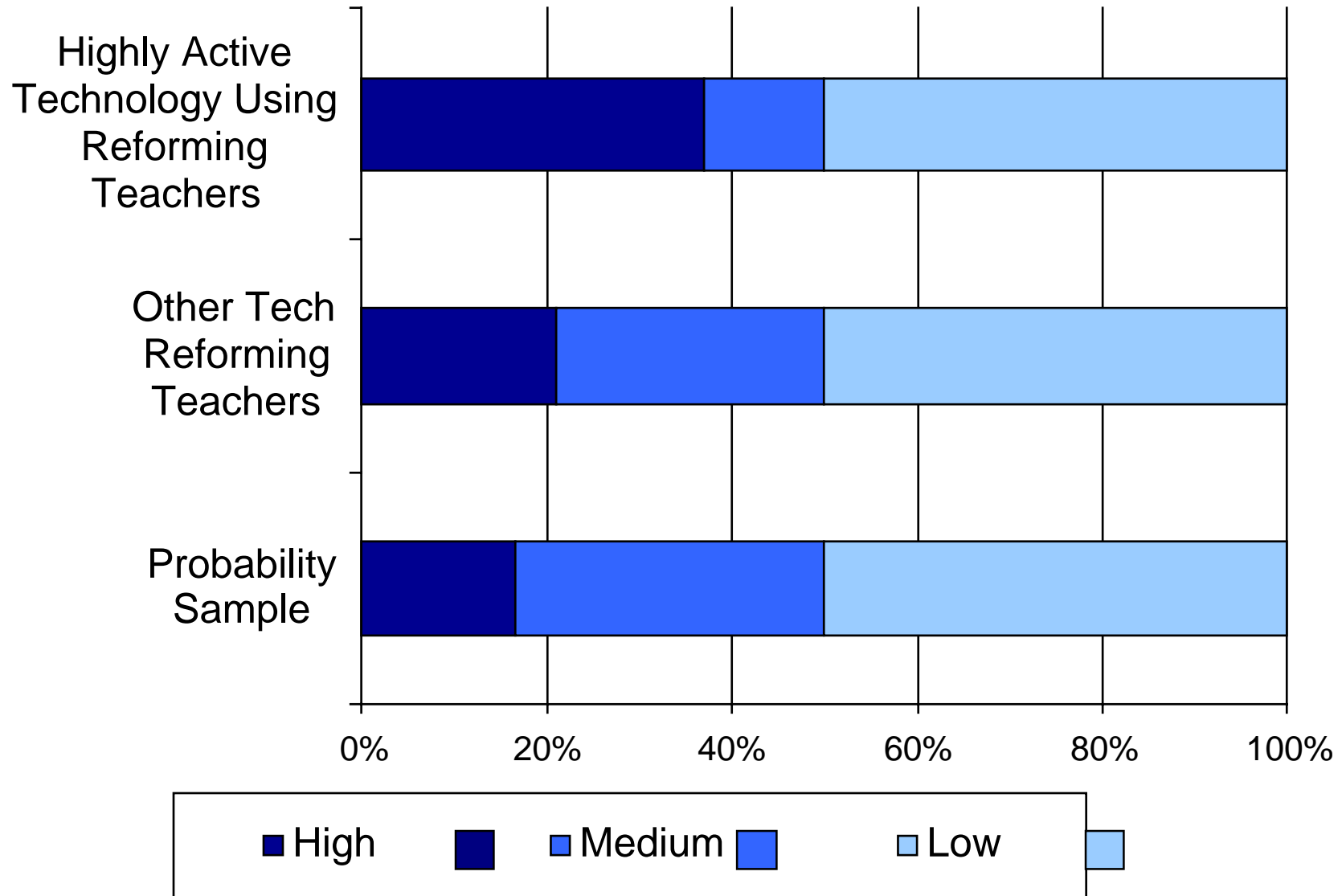
# Highly Active Technology Using Reforming Teachers Are More Likely to Teach in Above Average SES Communities



# More Likely to Be Deeply Experienced Teachers

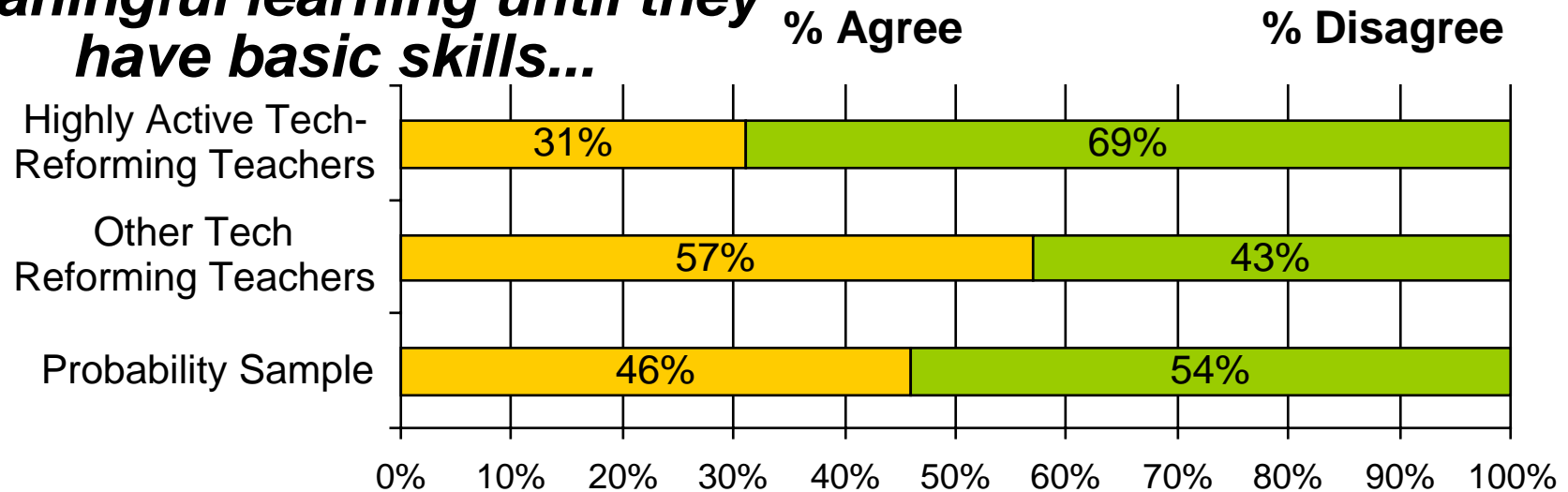


# Higher Quality of Technology Support

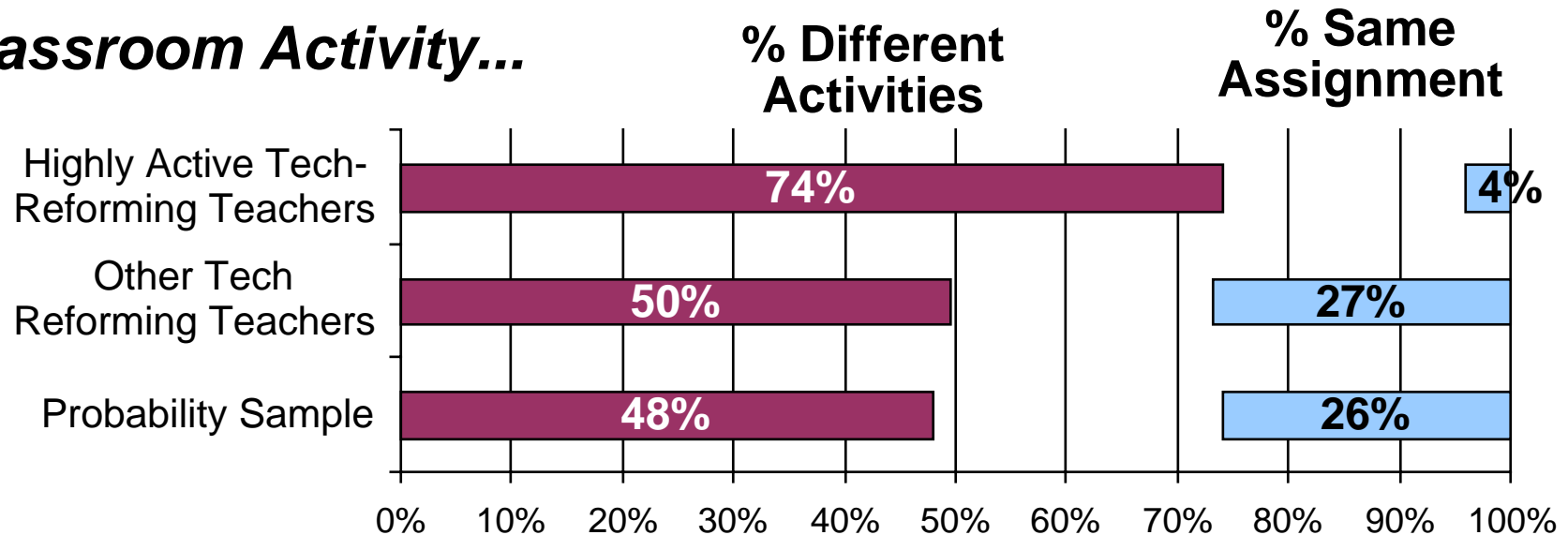


# Hold a Constructivist Philosophy

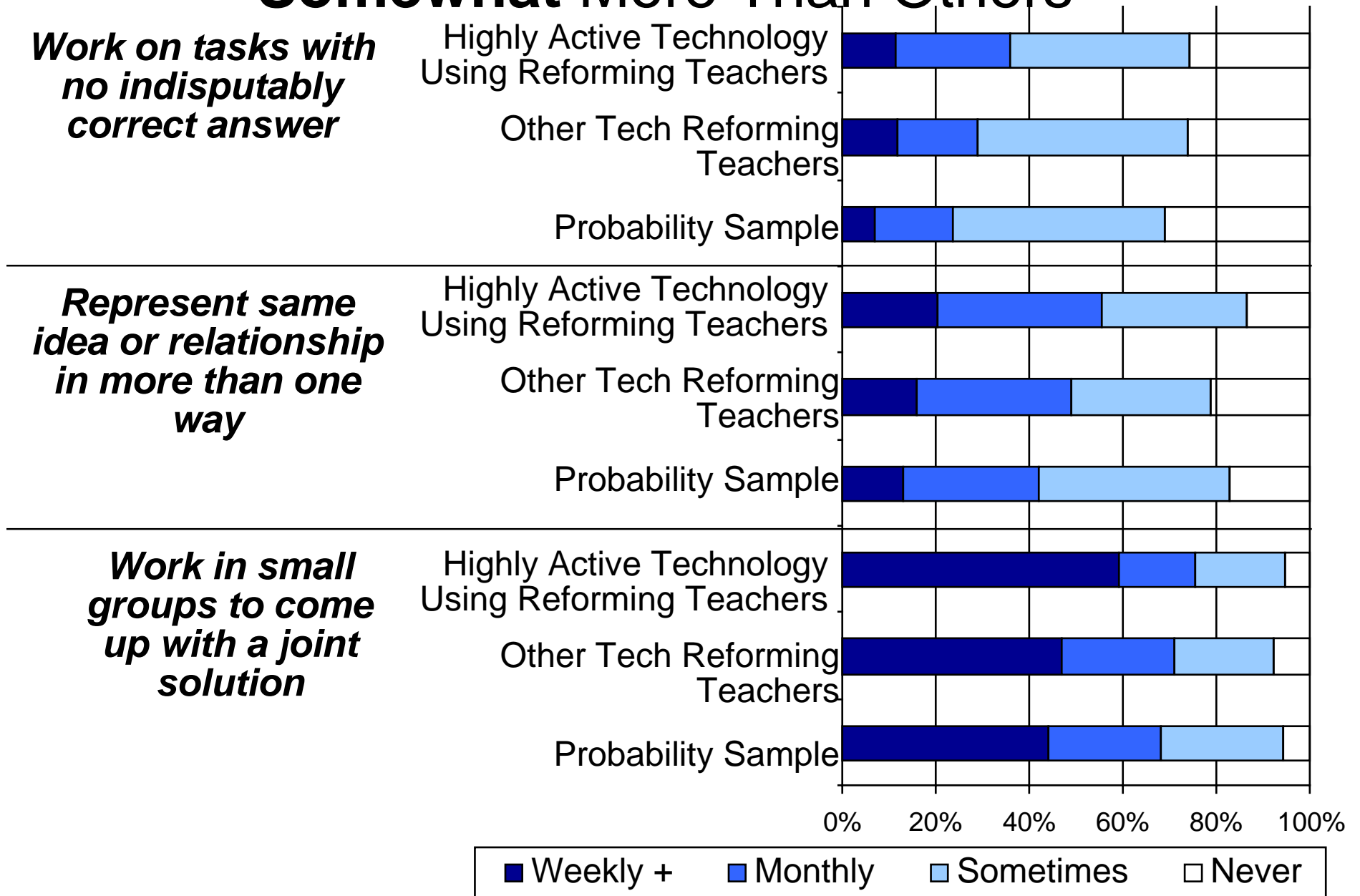
***Students are not ready for meaningful learning until they have basic skills...***



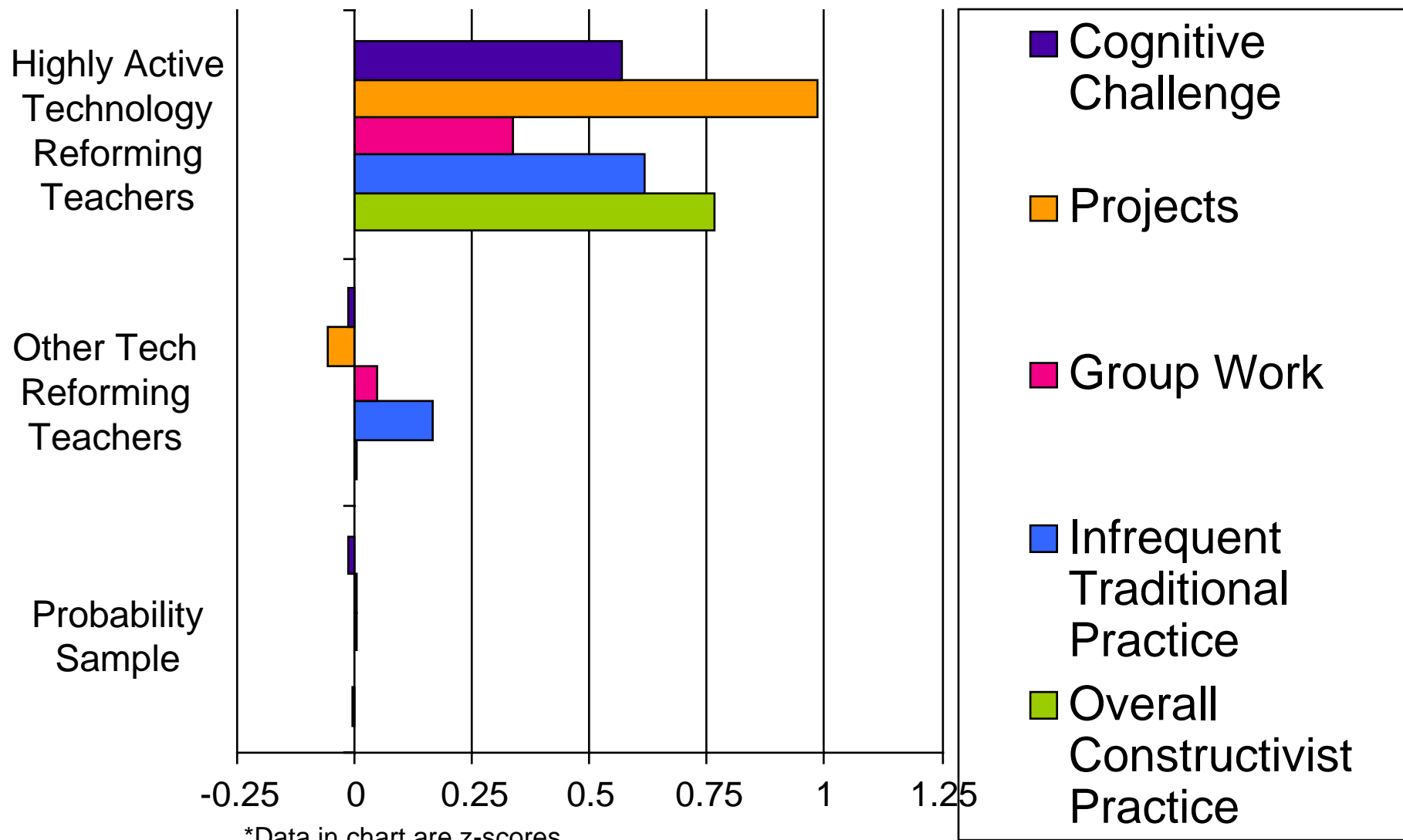
***Classroom Activity...***



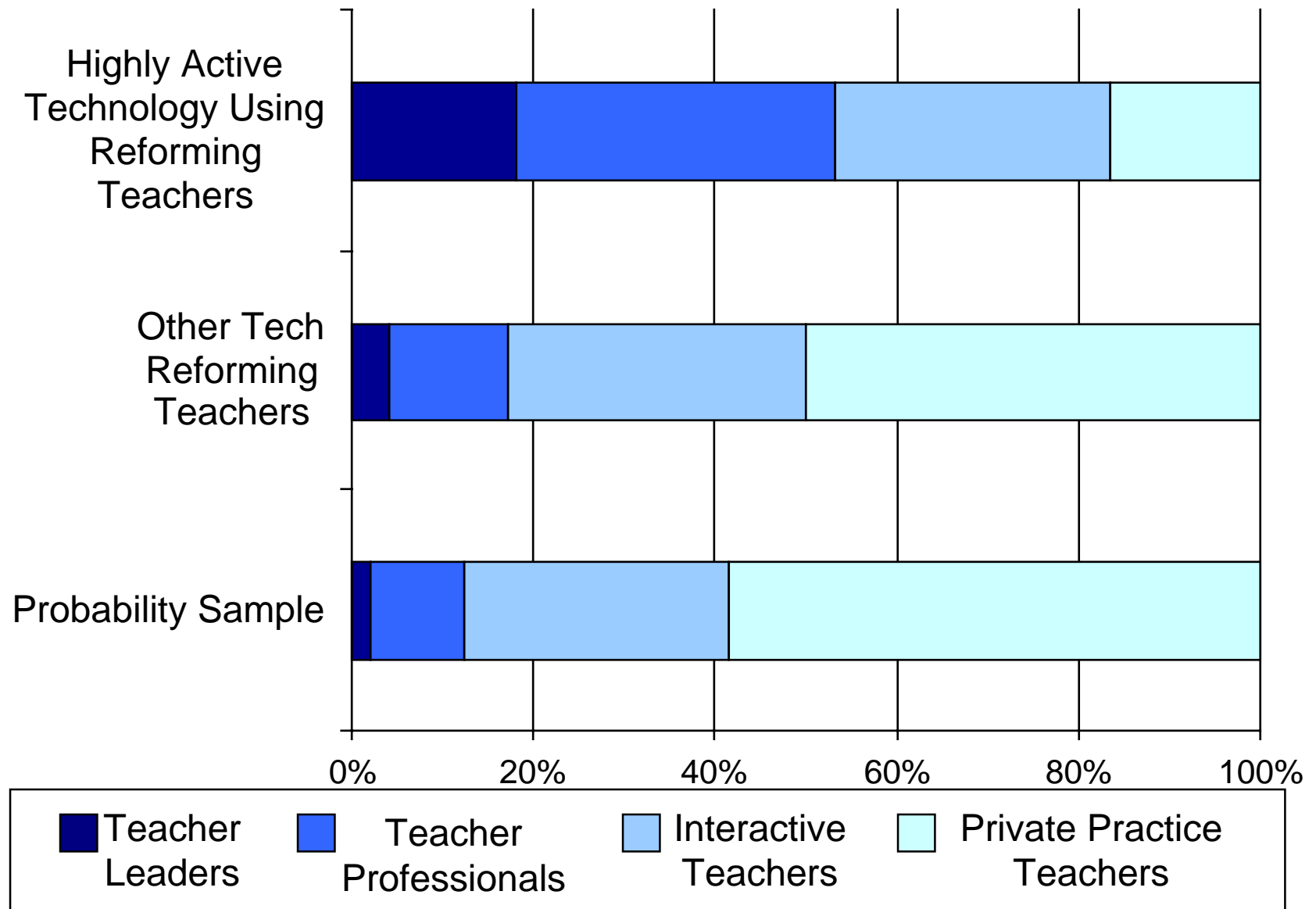
# Employ Individual Constructivist Practices Somewhat More Than Others



# But Big Difference on Constructivist Practice Scale



# 10 Times as Likely to be Teacher Leader; 4 Times as Likely to be Professionally Engaged



# In Summary

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- Teachers who participate in instructional reform programs that have a heavy dose of computer technology tend to be
  - very experienced teachers, most often computer or social studies teachers at upper-middle income schools with better-than-average support for teachers' computer use
  - who are clearly constructivist in their teaching philosophy and teaching practice
  - and who are professionally active with their peers
    - who talk with other teachers about instructional matters
    - who visit each others' classrooms
    - who participate on committees with teachers from other schools
    - who mentor other teachers
- In short, they are the kind of teachers who come to NECC!

# High-Tech teachers in High-Tech Schools

**Ronald E. Anderson, University of Minnesota**  
**Sara Dexter, University of Minnesota**

# The HiTech School Sample

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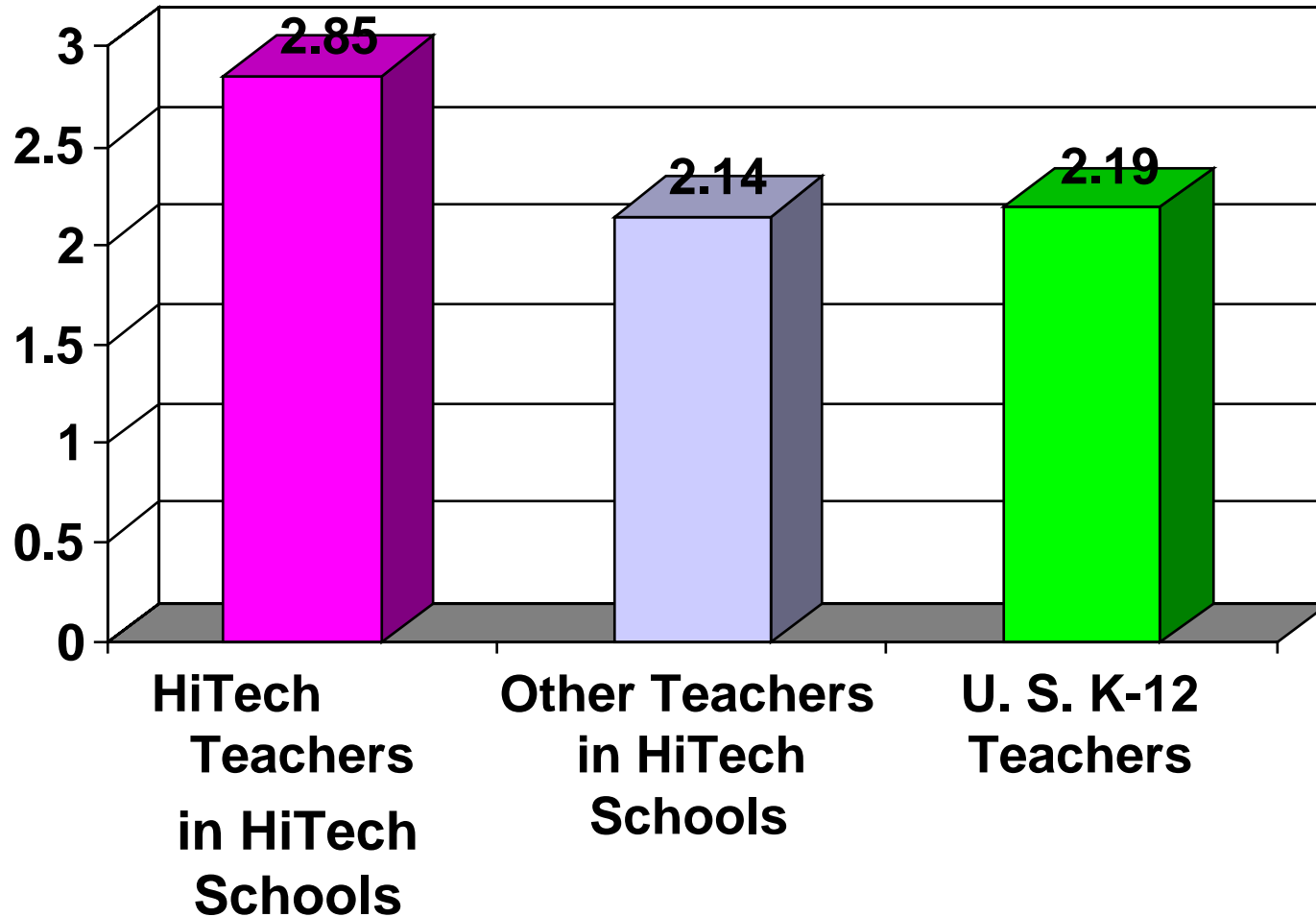
- Schools identified in the 1998 QED database as technologically intensive, based upon computer hardware and networking
- 269 teachers in about 80 of these schools responded to the TLC survey
- Of these teachers, 54 teachers (19%) met our criteria of “HiTech teacher,” based upon their diverse activities with technology

# Analytic Strategy

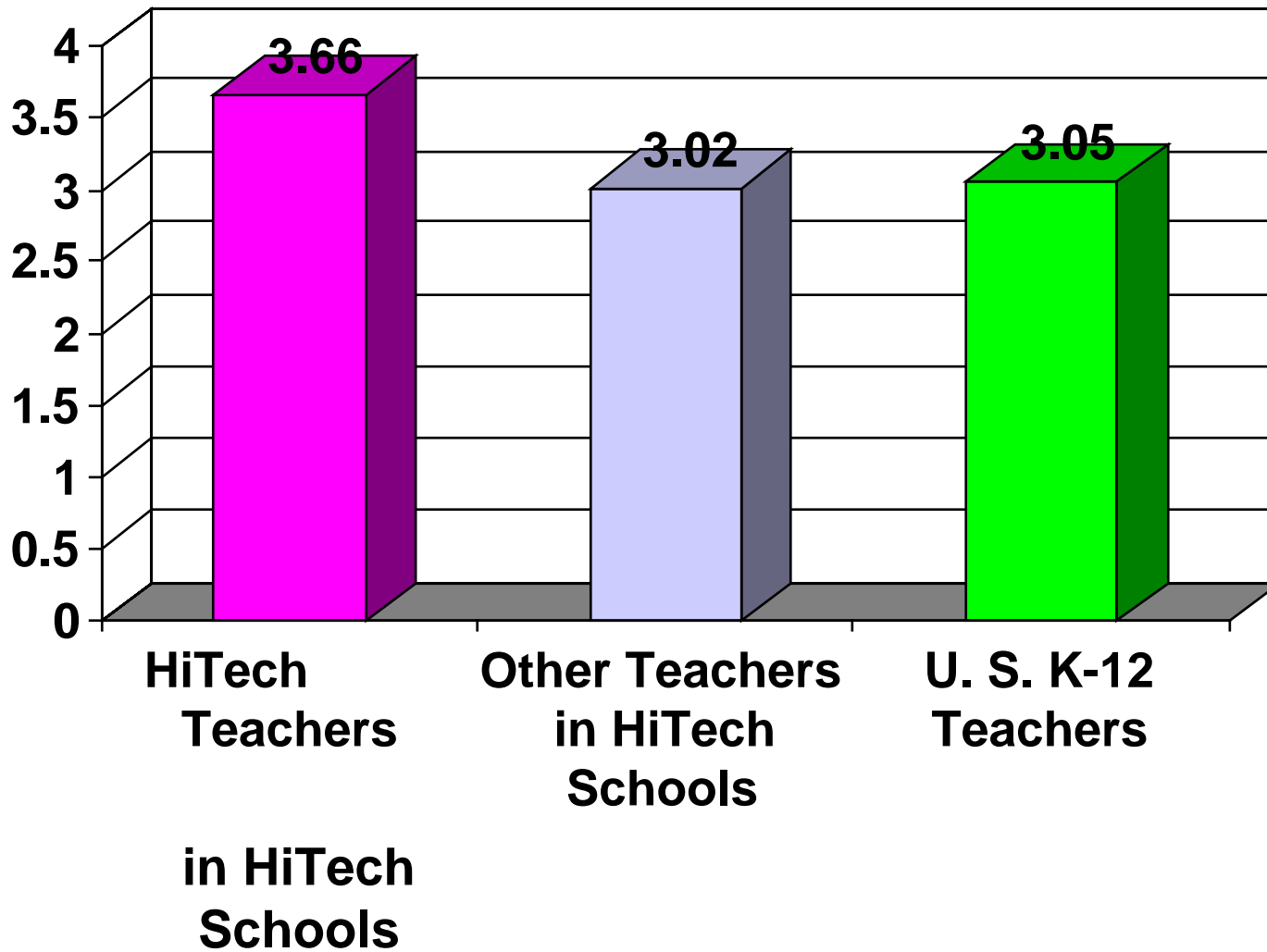
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- Contrast HiTech teachers in HiTech schools
  - with all teachers in U.S. schools, AND
  - with other Teachers in HiTech schools
- ON:
  - Teacher characteristics
  - Infrastructure
  - Quality of support

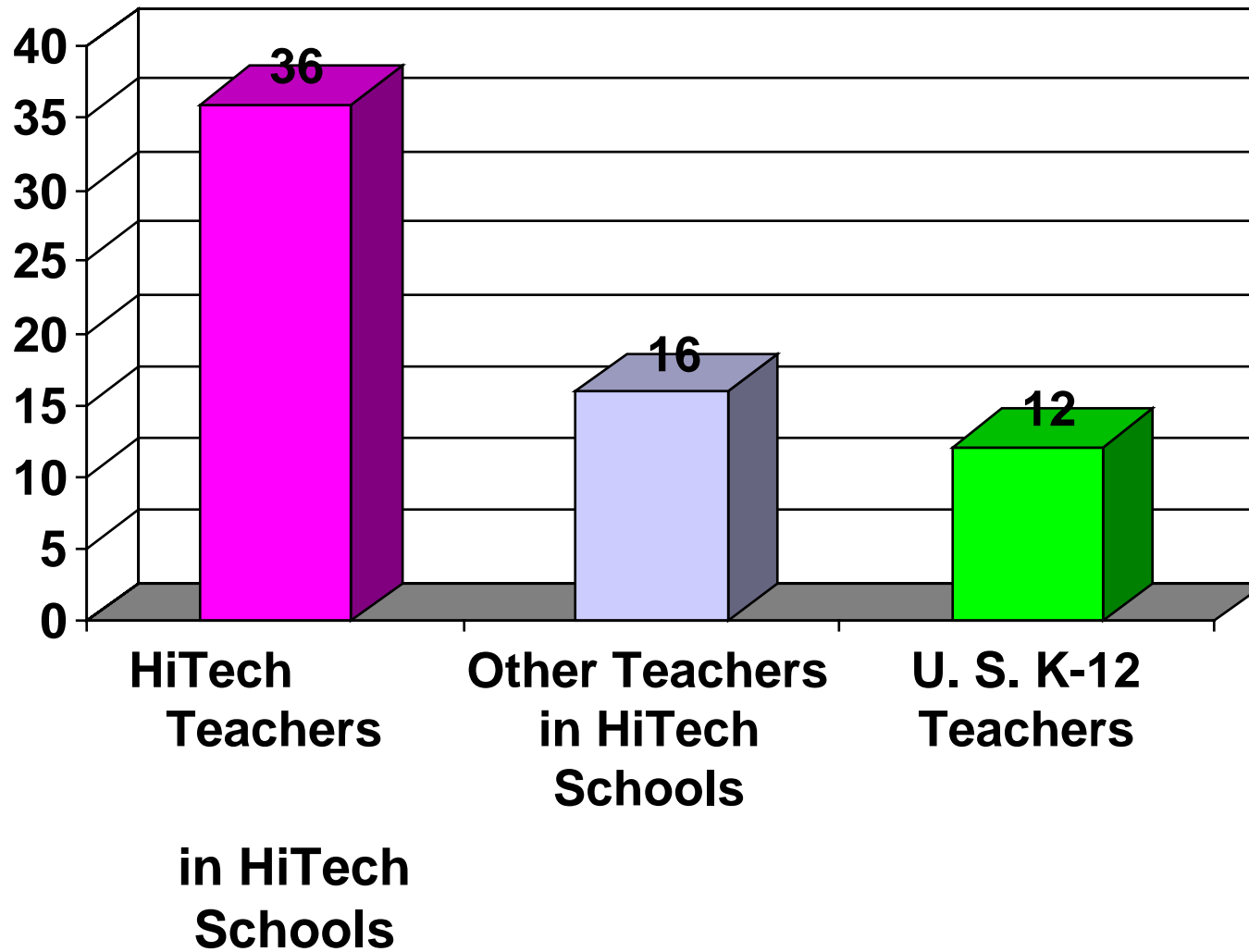
# IT Fluency (Expertise) of Teachers Comparing Subgroups, TLC 1998



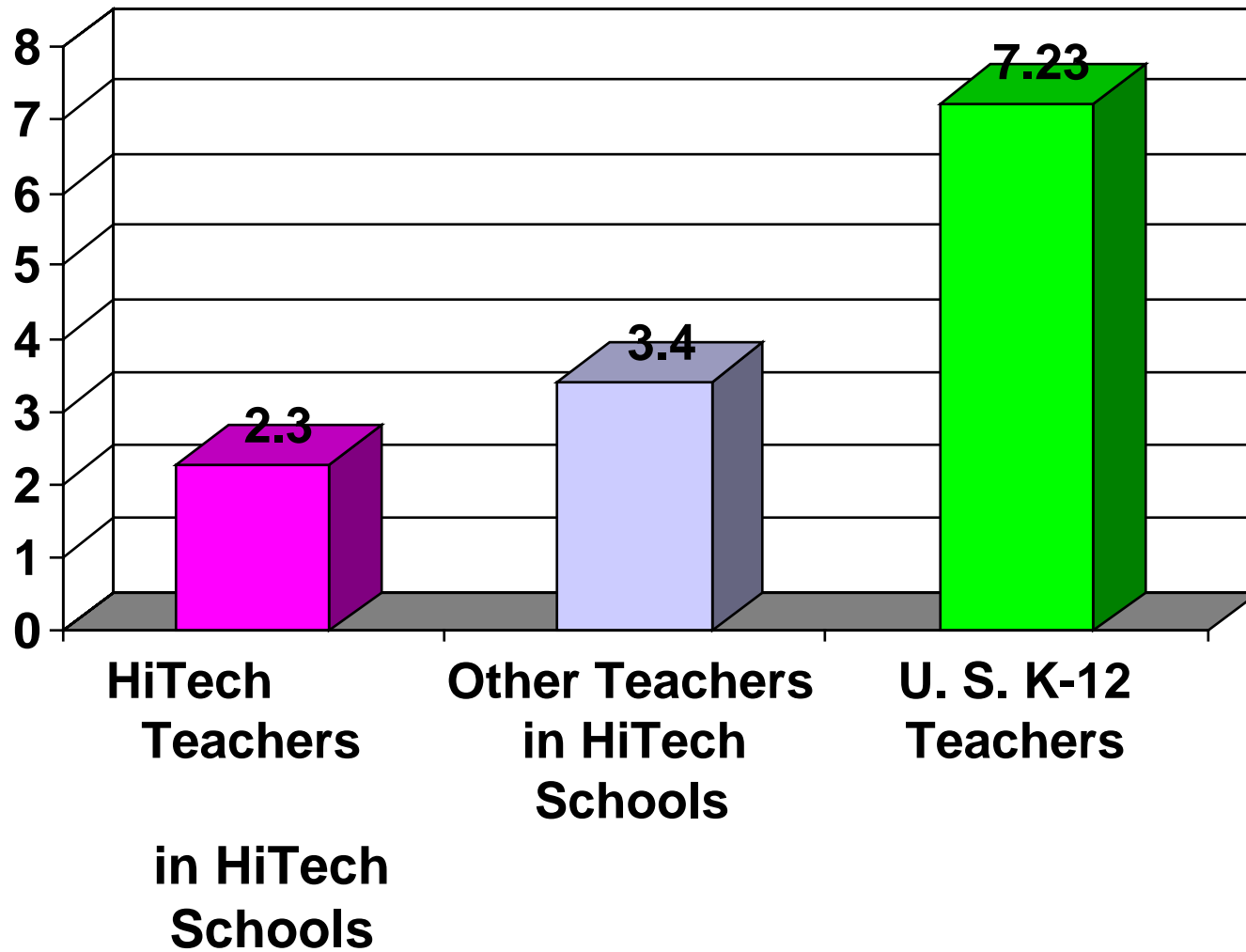
**HiTech Longevity** (years doing instructional computing) of Teachers Comparing Subgroups, TLC 1998



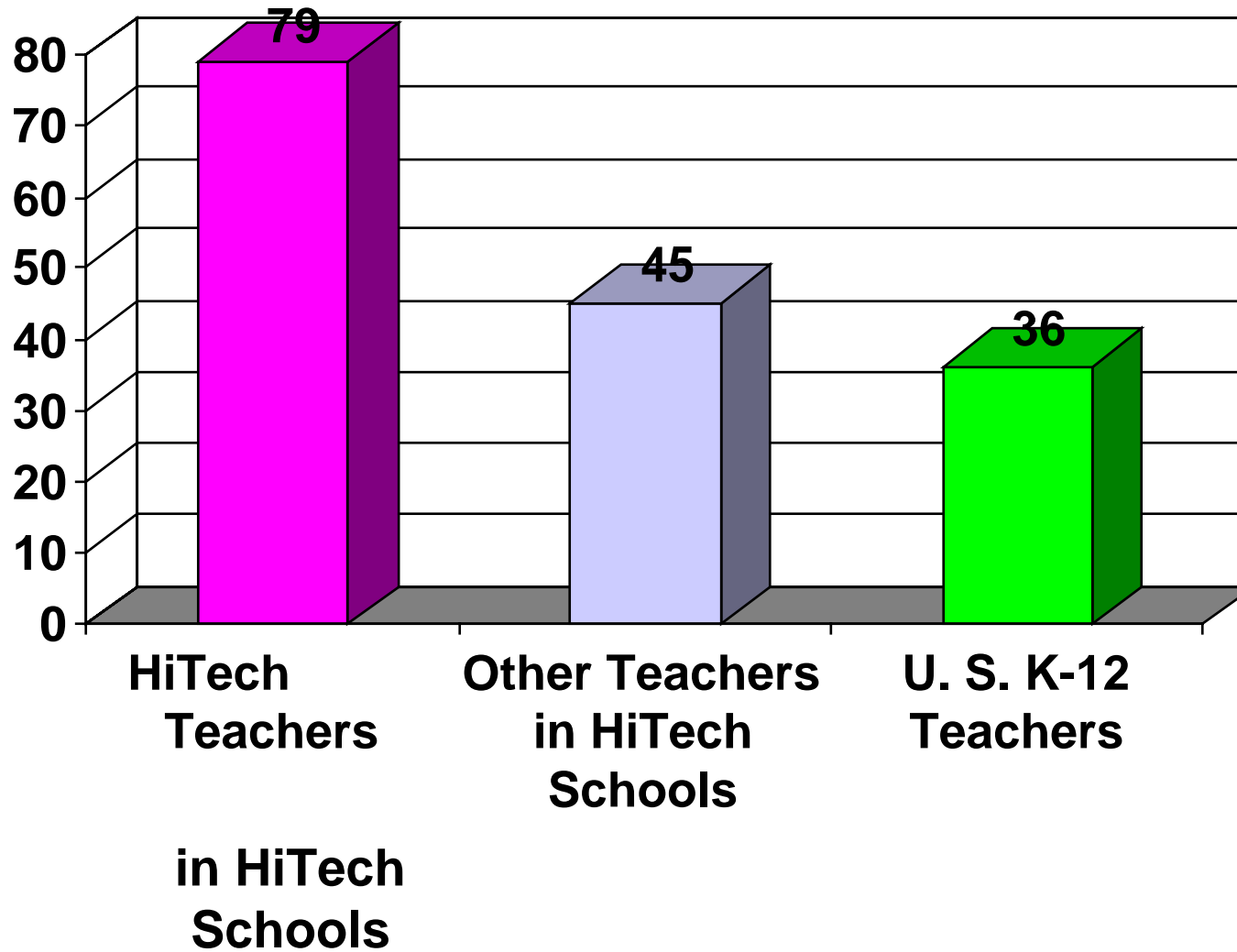
# Professionalism (percent of professionally oriented teachers), TLC 1998



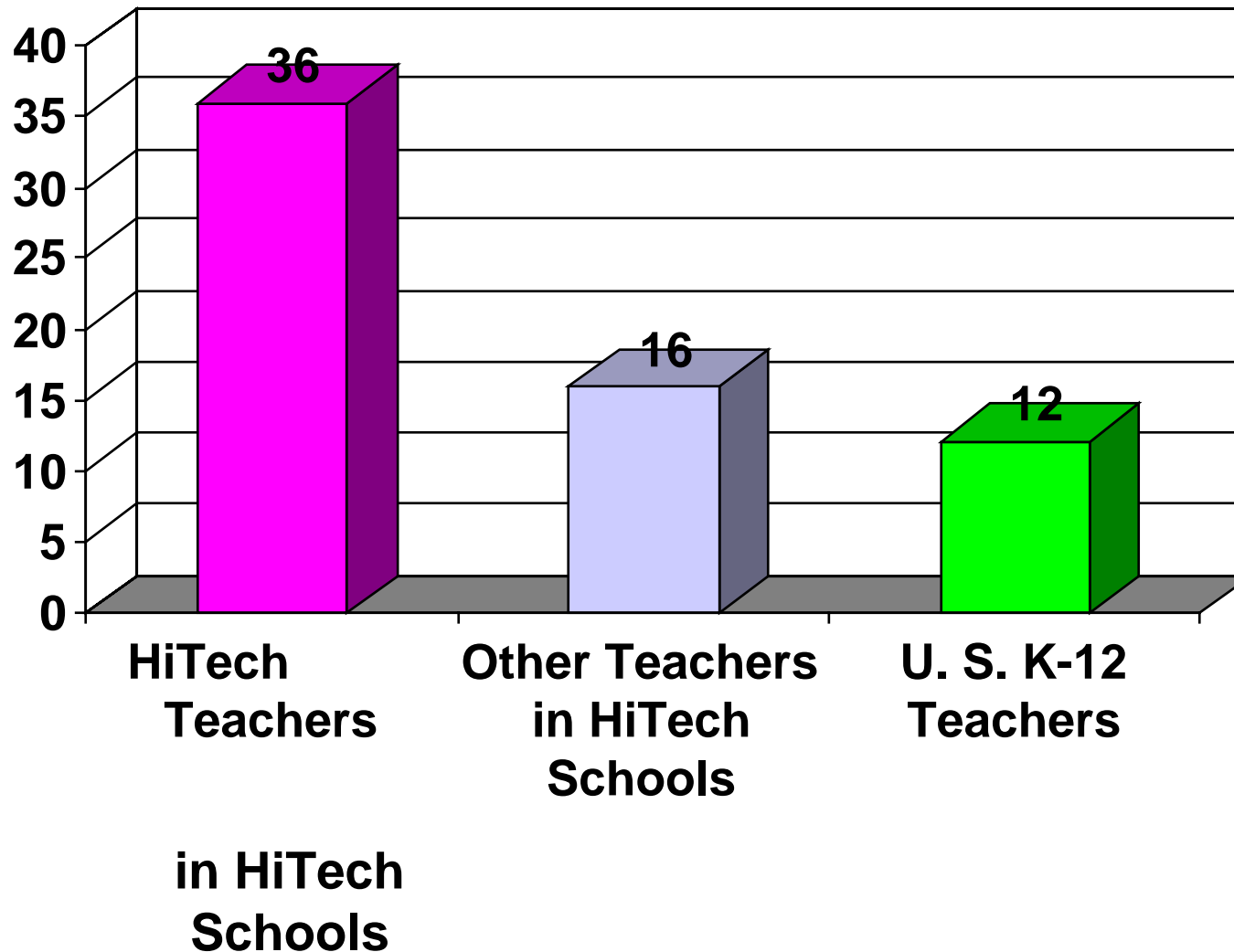
# Students Per Computer of Teachers' Schools, TLC 1998



# High-Speed (T1) Internet Access (Percent of Teachers with T1 Access in their School)



# High Income School Communities (Percent of Teachers in Schools Located in a High Income Zipcode, TLC 1998)



# Can HiTech Teachers in HiTech Schools Get Along Without Quality Technology Support?

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- Analysis of all U.S. teachers found that Quality of Tech Support predicted
  - Amount of instructional technology use
  - More professional uses of computers by teachers
  - Greater technology utilization over time
- Perhaps HiTech teachers are so resilient that they don't require good tech support...

# CEO Forum's Professional Development Framework:

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- Help teachers how to *integrate*, not just learn to operate
- Regularly scheduled, "just in time", or one-on-one learning opportunities
- Access to follow-up help from individuals with classroom and curriculum experience
- Access to educational technology resources near or in their work areas
- Wide spread participation by the staff

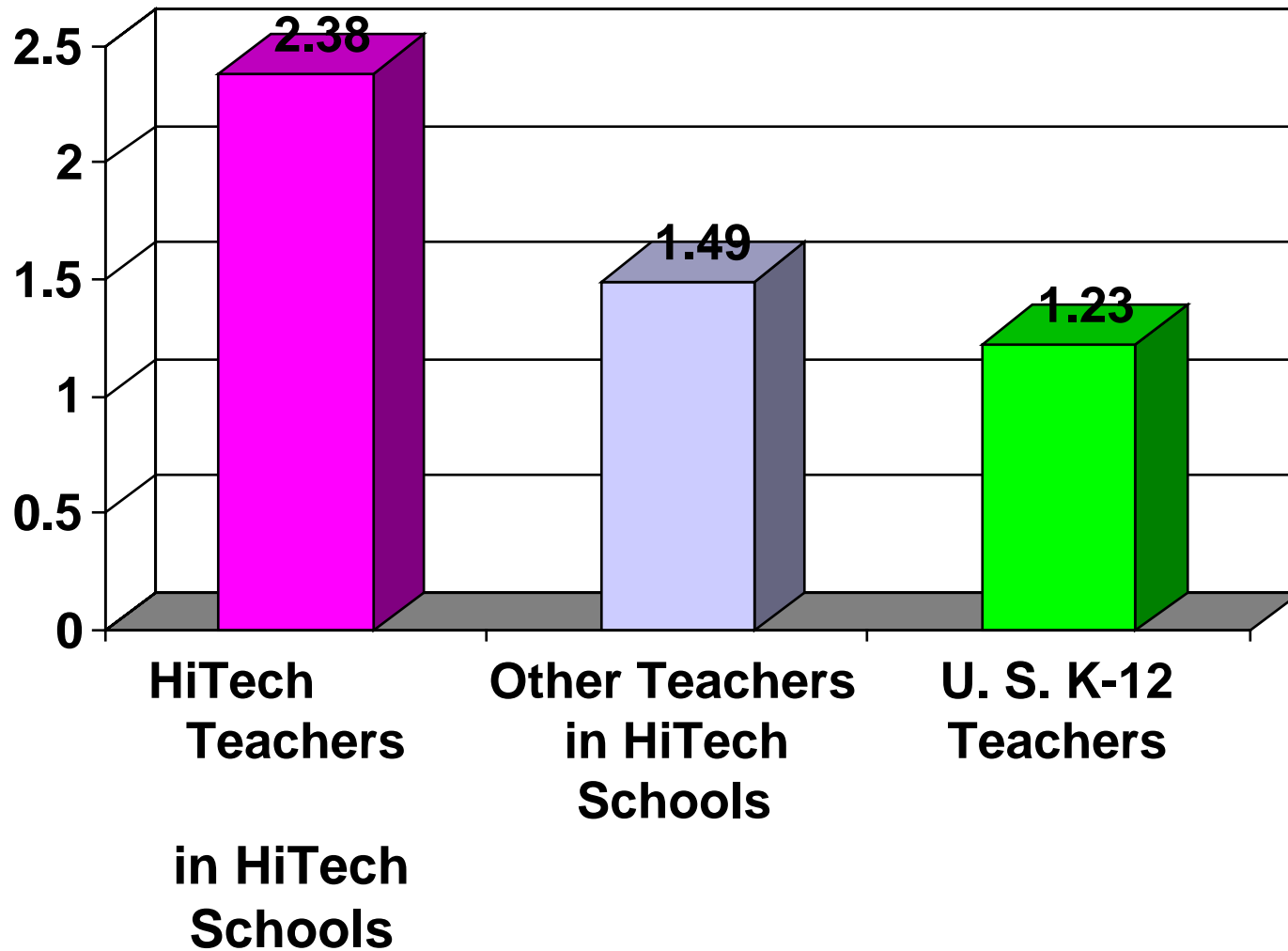
# Quality Technology Support

## What is it?

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- Access to one-on-one personal guidance and help.
- Professional development content focused on instruction and integration.
- Access to resources.
- Widespread teacher participation in technology professional development activities.

# Quality Technology Support of Teachers TLC 1998



# Quality Technology Support Who has it?

## U.S. Teachers

- Percent of Teachers Experiencing Number of Quality Aspects:

None	= 28%
One	= 34%
Two	= 25%
Three to four	= 13%

## HiTech Teachers in HiTech Schools

- Percent of Teachers Experiencing Number of Quality Aspects:

None	= 3%
One	= 3%
Two	= 47%
Three to four	= 47%

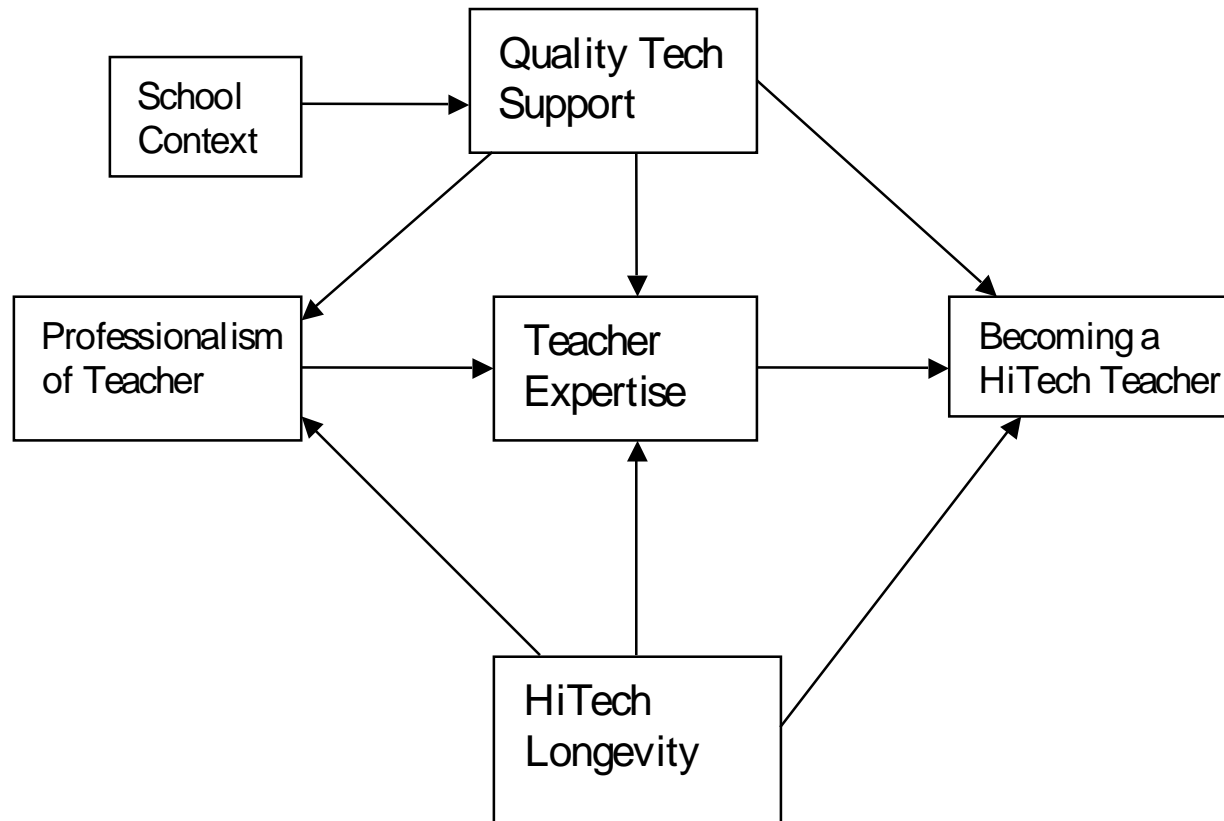
# Logistic Regression Predicting HiTech Status of Teachers in HiTech Schools, TLC 1998

Predictor is Statistically Significant if Probability is equal to or less than .05.

<b>Predictor</b>	<b>Probability</b>
<b>School Level</b>	.88
<b>Students Per Computer</b>	.76
<b>T1 Internet Access</b>	.12
<b>School Income Level</b>	.17
<b>Quality of HiTech Support</b>	.05
<b>IT Fluency/Expertise</b>	.01
<b>HiTech Longevity</b>	.05
<b>Professionalism</b>	.51

# Modeling Factors that Support Becoming a HiTech Teacher in a HiTech School

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# Conclusion and Implications

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- Few teachers are HiTech, even in HiTech schools: 10% in all schools qualify, whereas 19% in HiTech schools qualify
- Attributes that make a difference in supporting HiTech teaching in HiTech schools:
  - The Teacher: IT Expertise, Professionalism, HiTech Longevity
  - The School: Quality Tech Support, Resources, Access
- To support emergence of HiTech teachers, technology leaders should:
  - Develop broad vision of technology and pedagogy
  - Ensure staff support of instructional components of HiTech teaching
  - Provide for all elements of high quality technology support

# Strong Users of Student Multimedia Publishing

Kim Burge  
University of California, Irvine

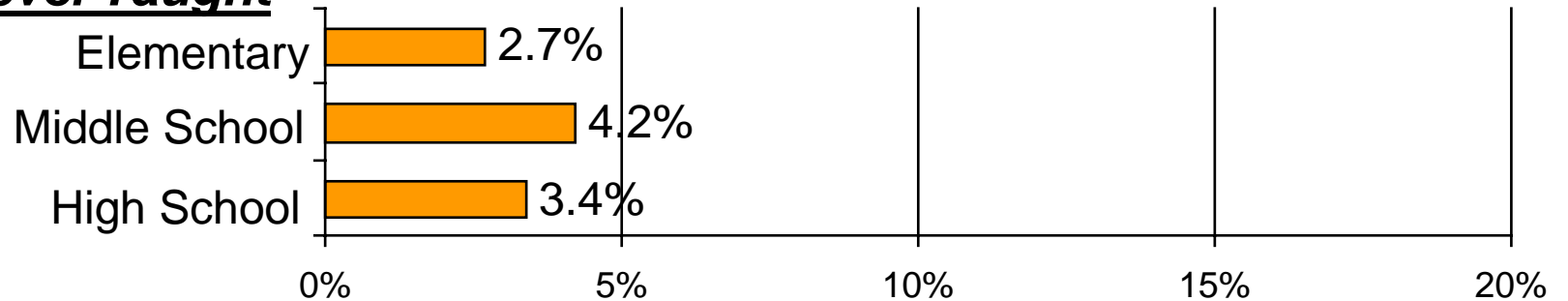
# Defining Strong Users of Student Multi-Media Publishing

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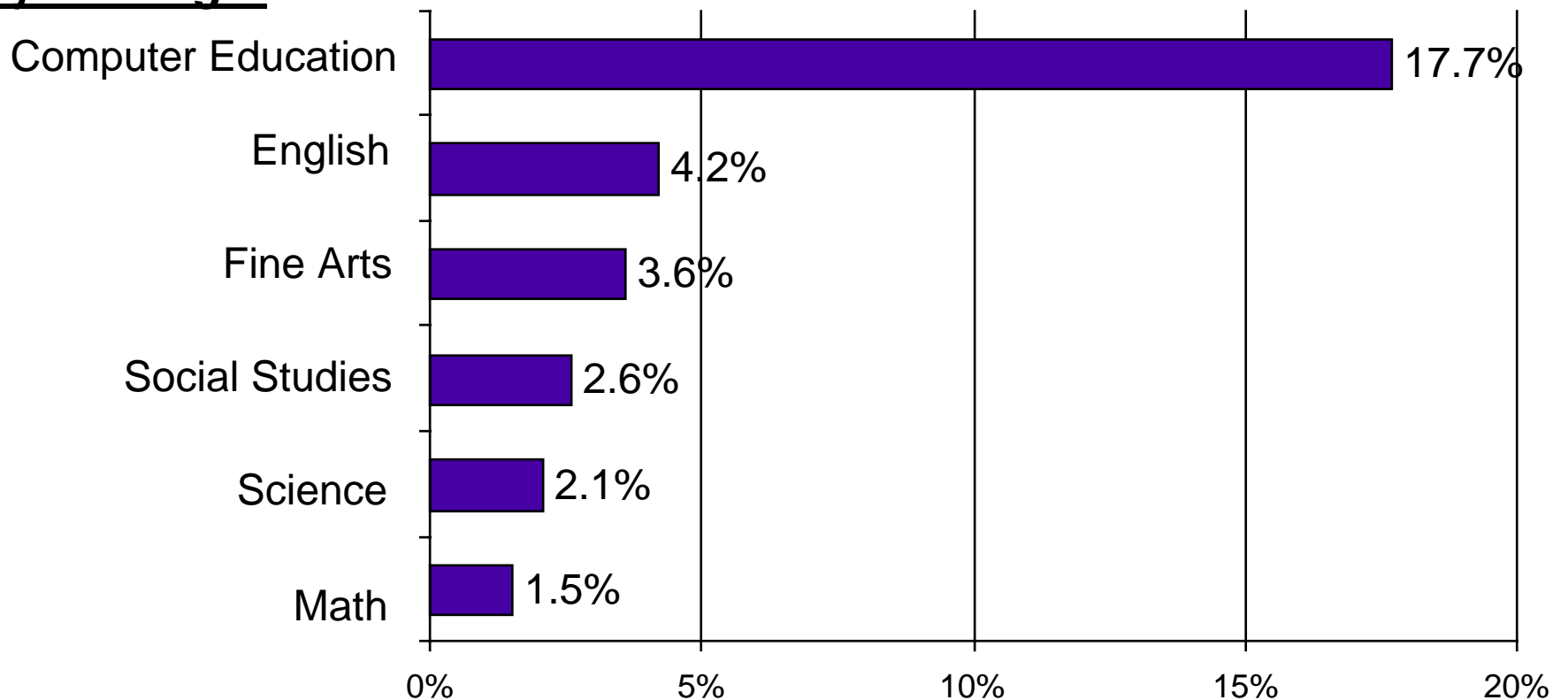
- Meet 3 of 5 criteria
  - Have students write illustrated stories with digitized images and sound and make multimedia presentations
  - Have students become experts about topics and publish text and pictures on the Web
  - Name a Web-authoring or multimedia-authoring program as among their most valuable software for teaching
  - Have students use presentation software in 10+ lessons during that school year
  - Have students use multimedia authoring software in 10+ lessons during that school year
- AND Meet the criteria for being “Highly Active Computer-User” which have been described before
- Only 3% of TLC sample (and 2% of representative sample) meet this definition.

# Strong Users of Student Multi-Media Publishing Who Are They?

## School Level Taught



## Subject Taught

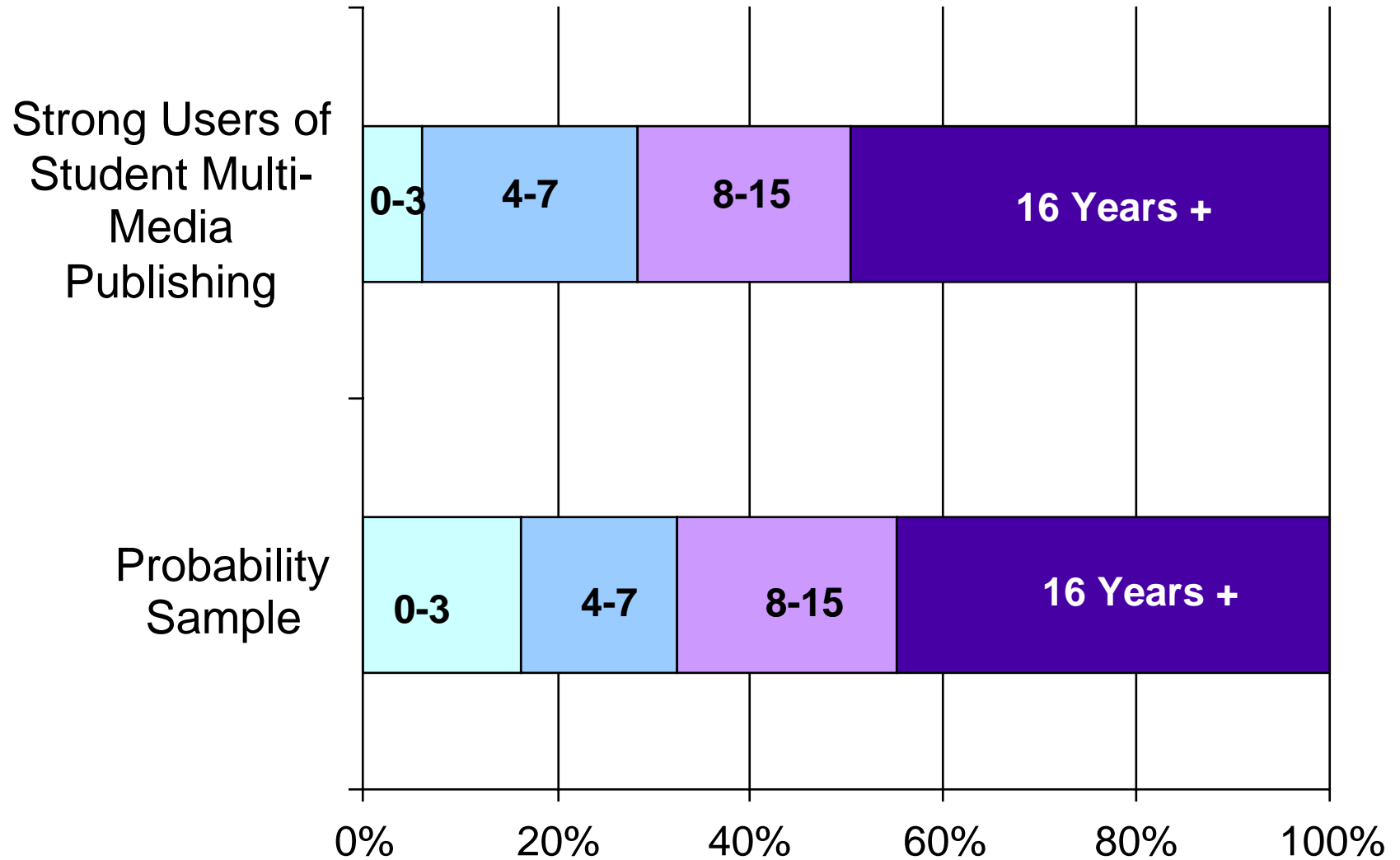


# Strong Users of Student Multi-Media Publishing Who Are They?

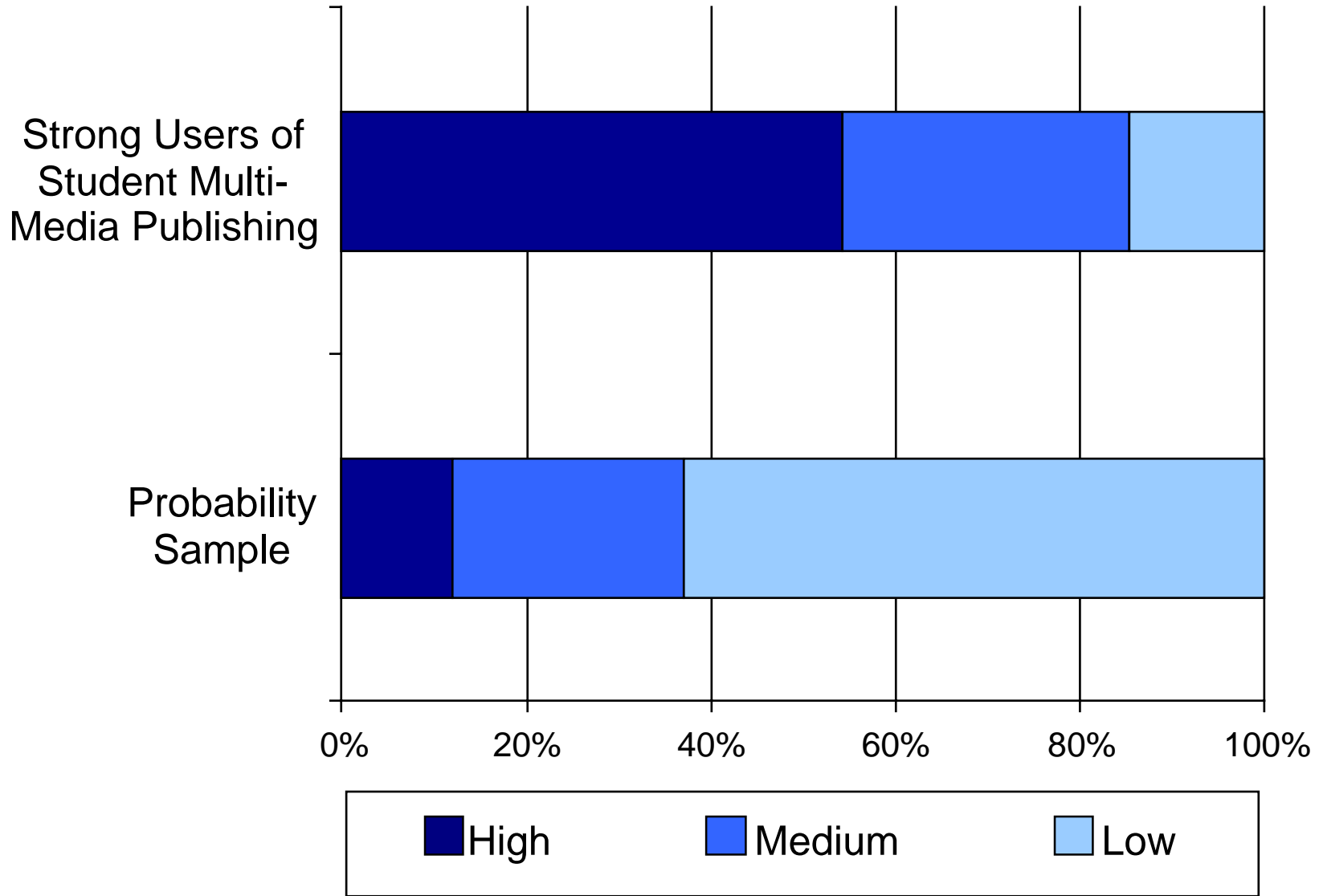
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- About the same percent...
  - of men and women teachers
  - by college GPA
- More...
  - More teachers who came from highly selective colleges
  - More teachers with Master degrees + 30 units beyond

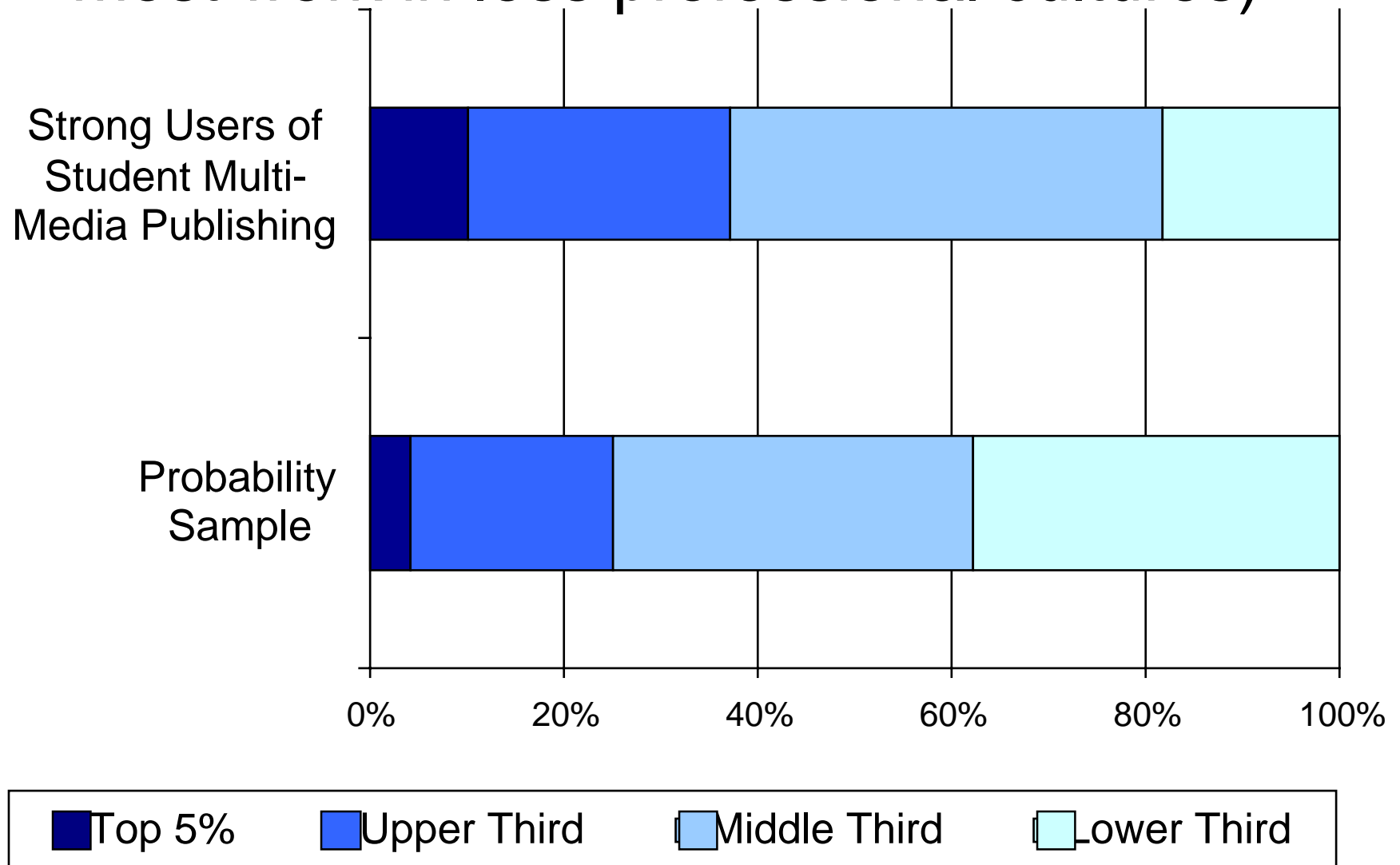
# By # of Years of Teaching Experience



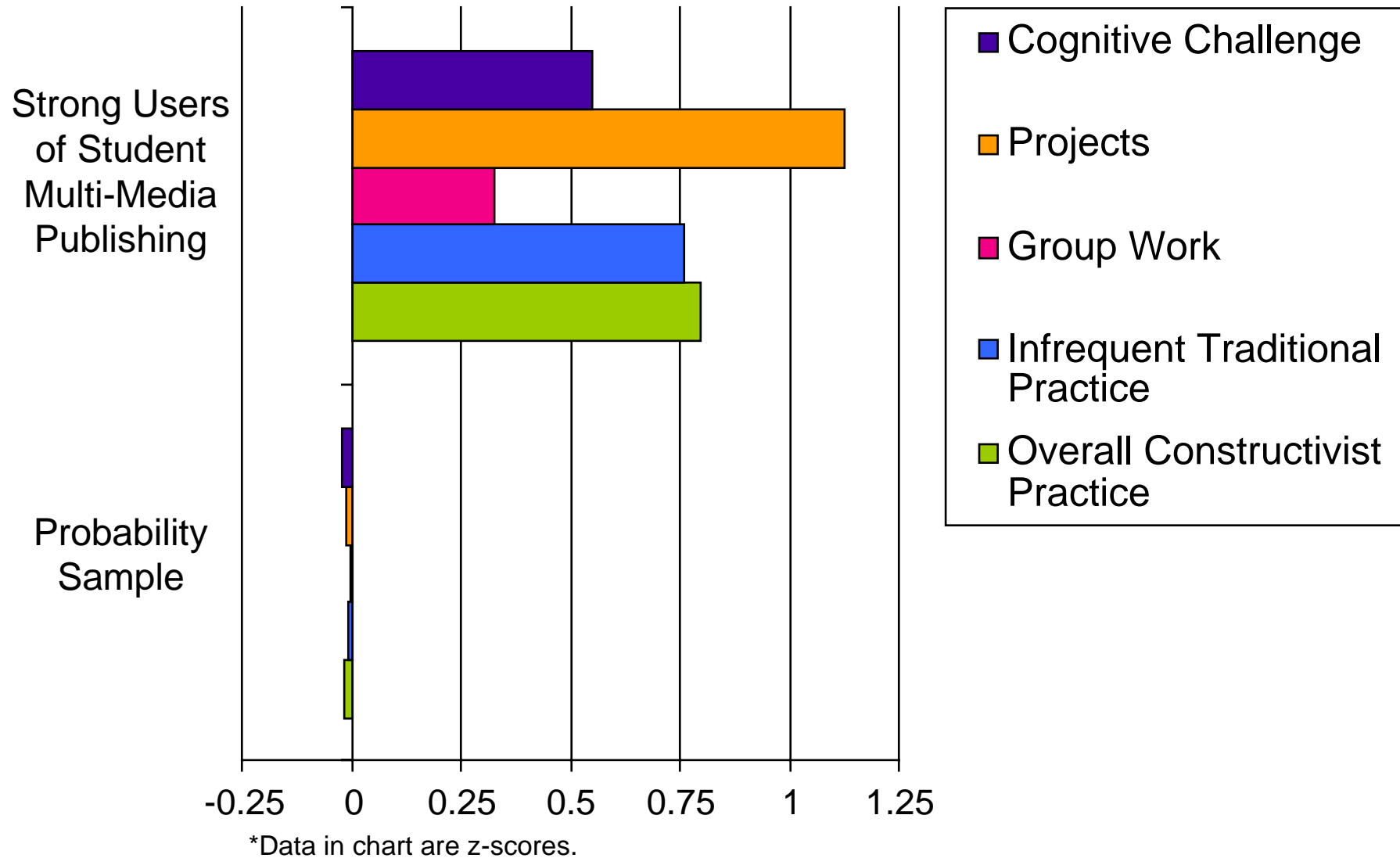
# Work at Schools With Excellent Technology Support



# Are More Likely Present where a Professional School Culture Prevails (though overwhelmingly most work in less professional cultures)

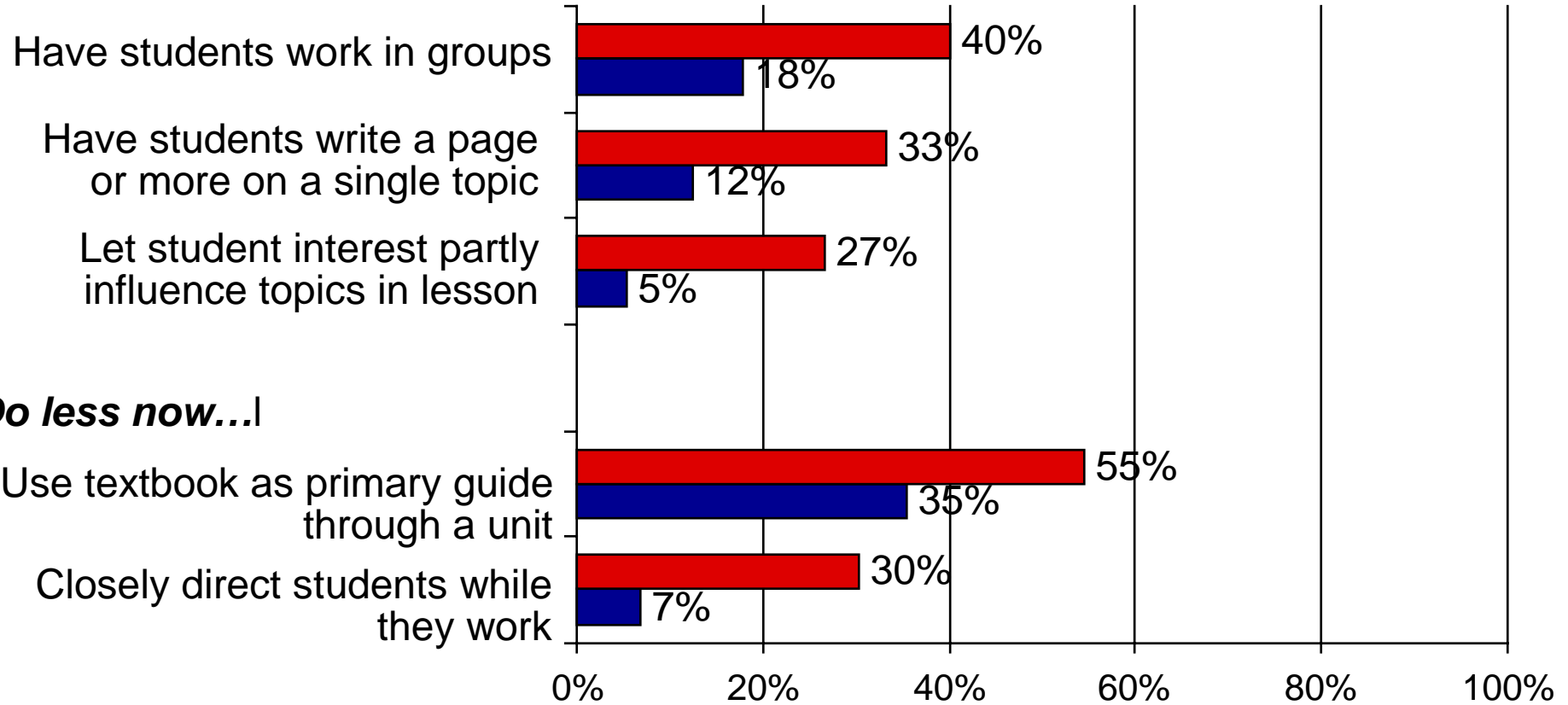


# Theirs is a More Constructivist Practice, not just for Projects but in terms of Cognitive Challenge Too

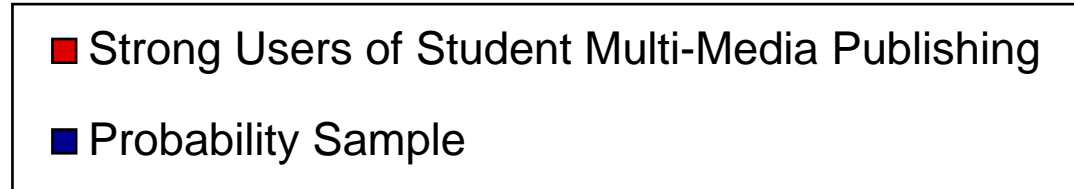
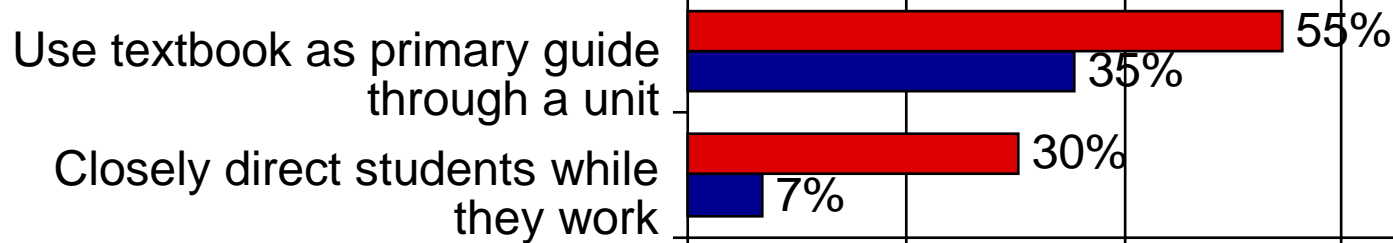


# Much More Constructivist Than They Were 3 Years Ago

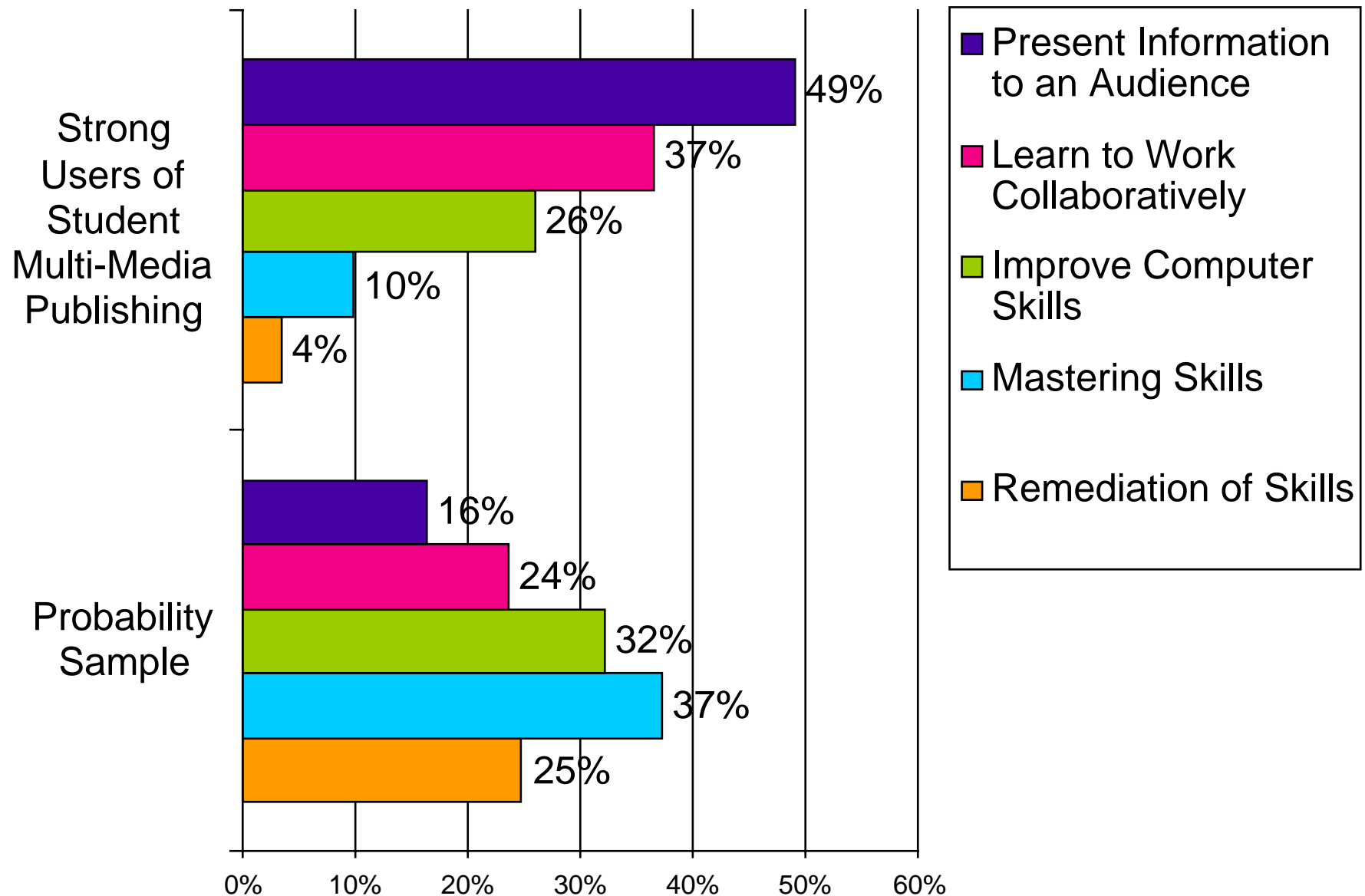
## *Do much more now...!*



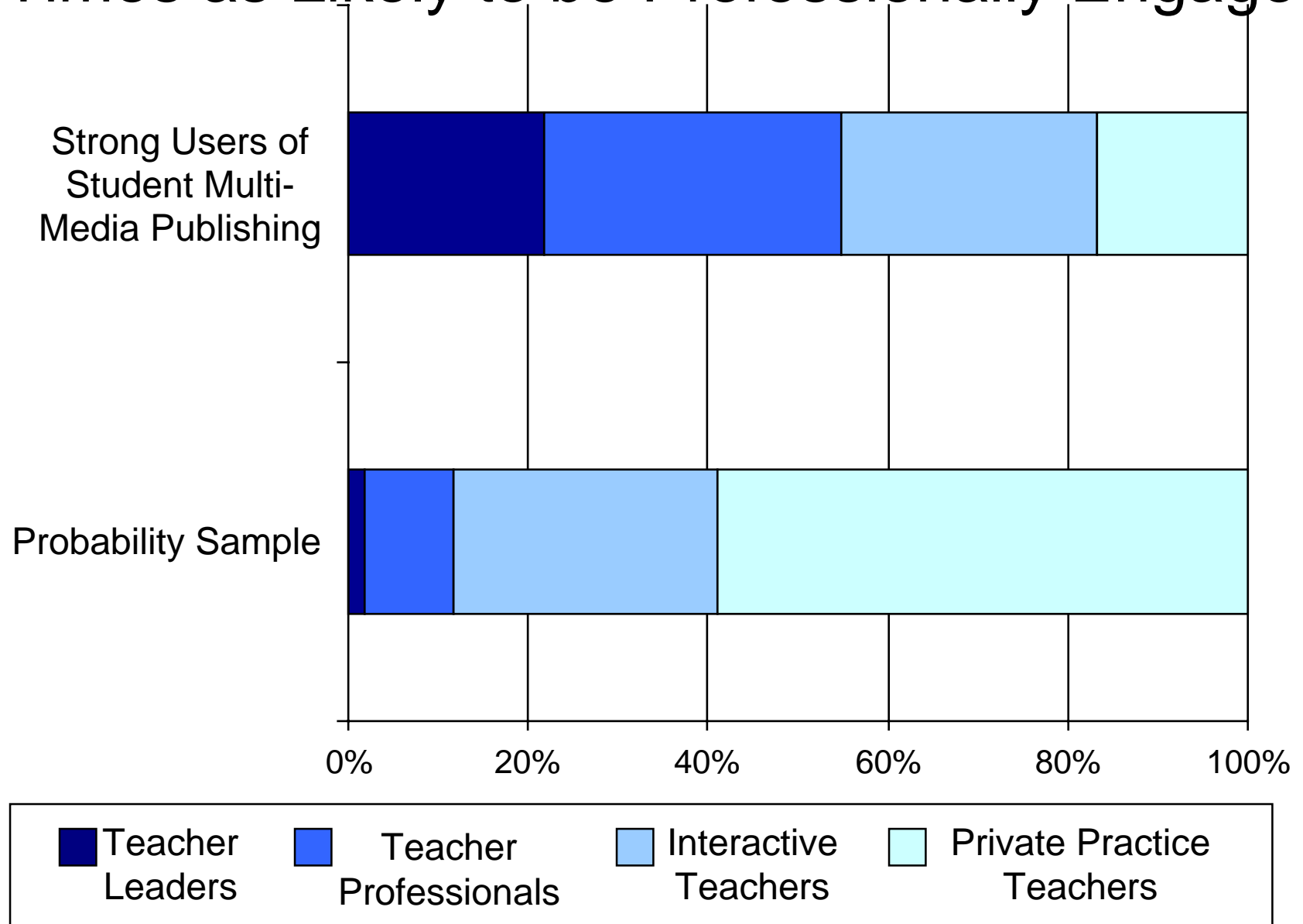
## *Do less now...!*



# Their Constructivist Teaching Philosophies Show Up Clearly by Their Objectives for Student Computer Use



# Ten Times as Likely to be Teacher Leaders; 4 Times as Likely to be Professionally Engaged



# Student Multi-Media Publishing: Consistency Between Research and Practice

- Chris Dede's "Silver Bullet ... Teachers and administrators who use new media are assumed to be automatically more effective than those who do not." (ASCD Yearbook, 1998)
- David Perkins' "Thoughtful Classroom ... Use of generative topics, mental images, understanding performances etc." (Smart Schools)
- Kim Burge's "Multimedia Computer Learning ... Examining gender differences in learning behaviors." (Dissertation, 1999)
- Stone Wiske's "New culture of teaching for the 21st Century... We need to pay more attention to the conditions affecting the culture and profession of teaching." (The Digital Classroom, 2000, Harvard Education Letter)

# Summary

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- A MAJORITY of Highly Active Computer-Users in Reform Programs and Teachers using Student Multimedia Publishing are Professionally Engaged Teachers compared to 1/8 of teachers nationally.
- So do more than 1/3 of teachers in high-tech schools, even without a clear reform emphasis
- Professionally Engaged Teachers Are 6 Times as Likely to be Highly Active Computer-Users as Private Practice Teachers
- All Groups Studied Are Substantially More Constructivist Than Typical Teachers--not just in terms of active learning, but in terms of providing cognitively challenging instruction.

# Conclusions

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- Cuban is right: Most teachers aren't prepared to use computers in a sophisticated and effective way
- When conditions are right--resources available, modest technical expertise, and a belief in and desire to practice a constructivist-compatible pedagogy--most teachers use computers very well.
- Moreover, these exemplary computer-using teachers are leaders in their profession, just as professionally engaged teachers are active computer-users as well.
- Schools and districts wanting to improve student accomplishment need to take heed of its most knowledgeable and leadership-oriented teachers
- Give them the resources, flexibility, and authority to help other teachers join them in building a new model of education for the 21st century
- Assuring that computers are not "oversold and underused" any more

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# TEACHING, LEARNING AND COMPUTING - - 1998

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<http://www.crito.uci.edu/TLC>

# Report Series Available on Web & Hard Copy

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- *Internet Use by Teachers (available now)*
- *Computer Presence in American Schools (available now)*
- *Teacher and Teacher-Directed Student Use of Computers (available now)*
- *Constructivist-Compatible Beliefs and Practices among U.S. Teachers (available next month)*
- *Staff Development & School Support for Teachers' Computer Use (available now)*
- *School Decision-Making on Technology*
- *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*

# Special Reports Available on Web

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- *The Beliefs, Practices and Computer Use of Teacher Leaders*
- *Secondary Teachers of Mixed Academic Subjects: “Out-of-Field” Problem or Constructivist Innovators?*
- *Who’s Wired and Who’s Not* - Excerpts from article written for the David and Lucile Packard Foundation
- *Computer Use and Pedagogy in Co-NECT Schools, A Comparative Study*
- *Teacher Professionalism, School Work Culture and the Emergence of Constructivist-Compatible Pedagogies*
- *Report to Participants*

# Contact Us

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## At University of California, Irvine:

Henry (Hank) J. Becker <hjbecker@uci.edu>  
<http://www.gse.uci.edu/doehome/deptinfo/faculty/becker/>

Margaret M. Riel <mriel@uci.edu>  
<http://www.gse.uci.edu/mriel.html/>

Kimberly B. Burge <kburge@uci.edu>

YanTien (Yani) Wong <yantienw@uci.edu>

## At University of Minnesota:

Ron E. Anderson <rea@iea.soc.umn.edu>

Sara L. Dexter <sdexter@tc.umn.edu>