



Student diversity in CS1

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Context

Introduction to Programming course at ETH Zurich

Since 2003



To “know your audience” is one of the fundamental rules of mass communication

In introductory programming courses:
high diversity of prior knowledge

Study setup



Questionnaire on computing and programming knowledge

- Computer literacy
- Programming experience
- Programming languages

Participants of ETH

Changes over years?

- Beginning of Introduction to Programming 2003-2008
- On paper (2003), later online
- Answers from 753 of 1130 CS students

Participants of University of York

- 2008 only
- Online
- Answers from 77 of 101 CS & Math students

Differences between institutions?

Computer usage



≤ 1 year: 0%

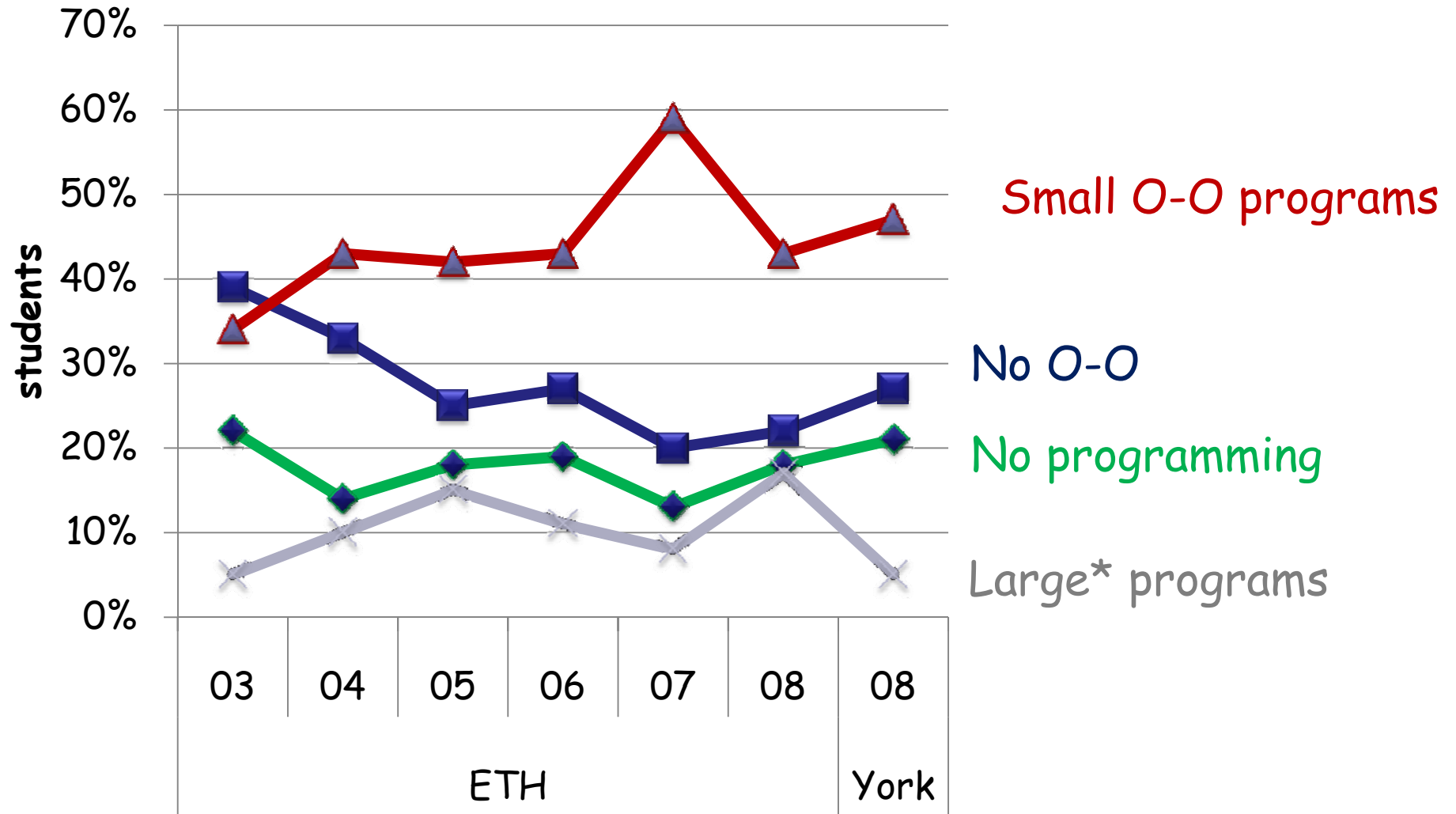
2 to 4 years: 3%

5 to 9 years: 42%

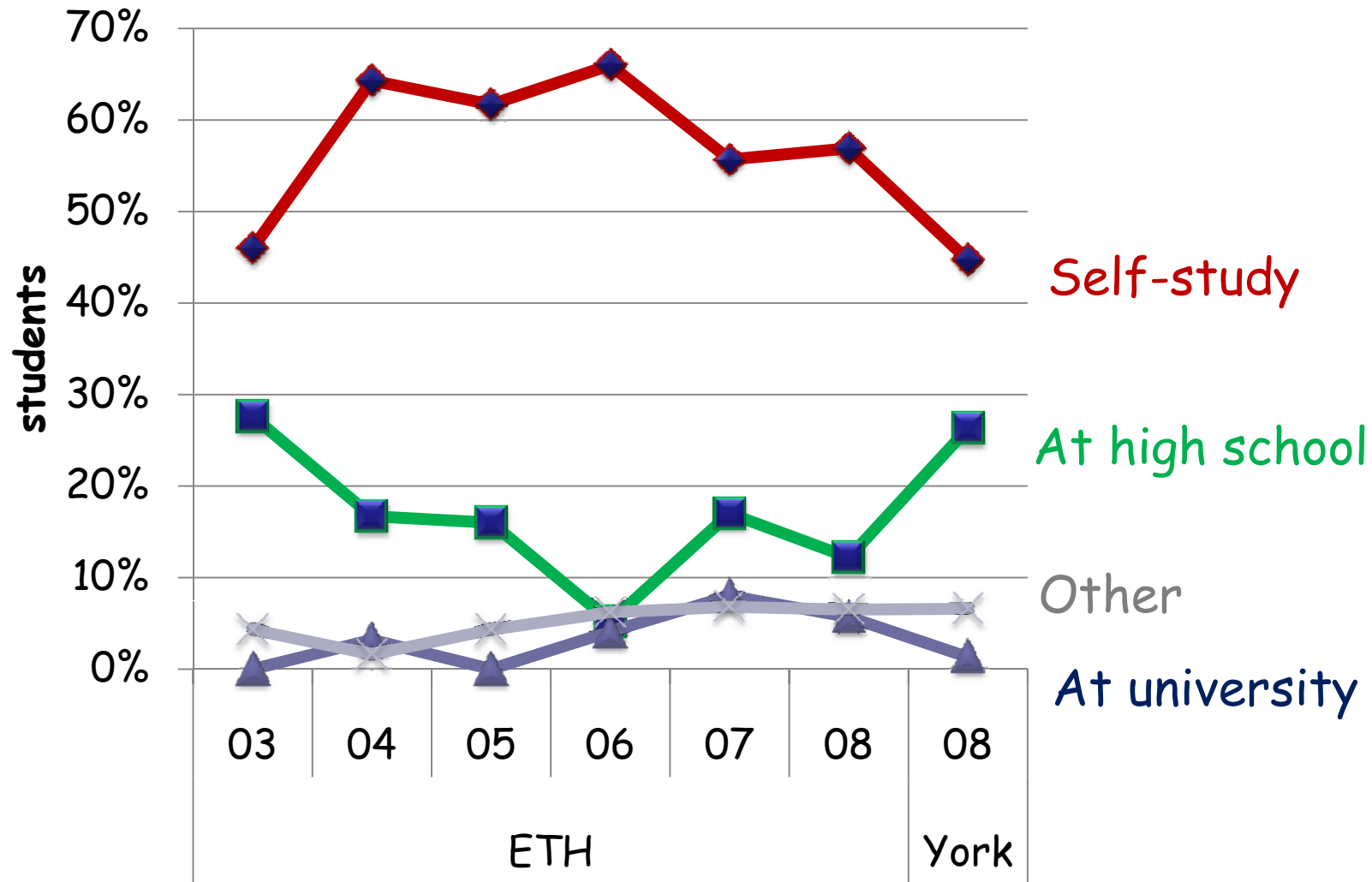
≥ 10 years: 59%

*Averages over 5 years,
2003-2007
(yearly variations small)*

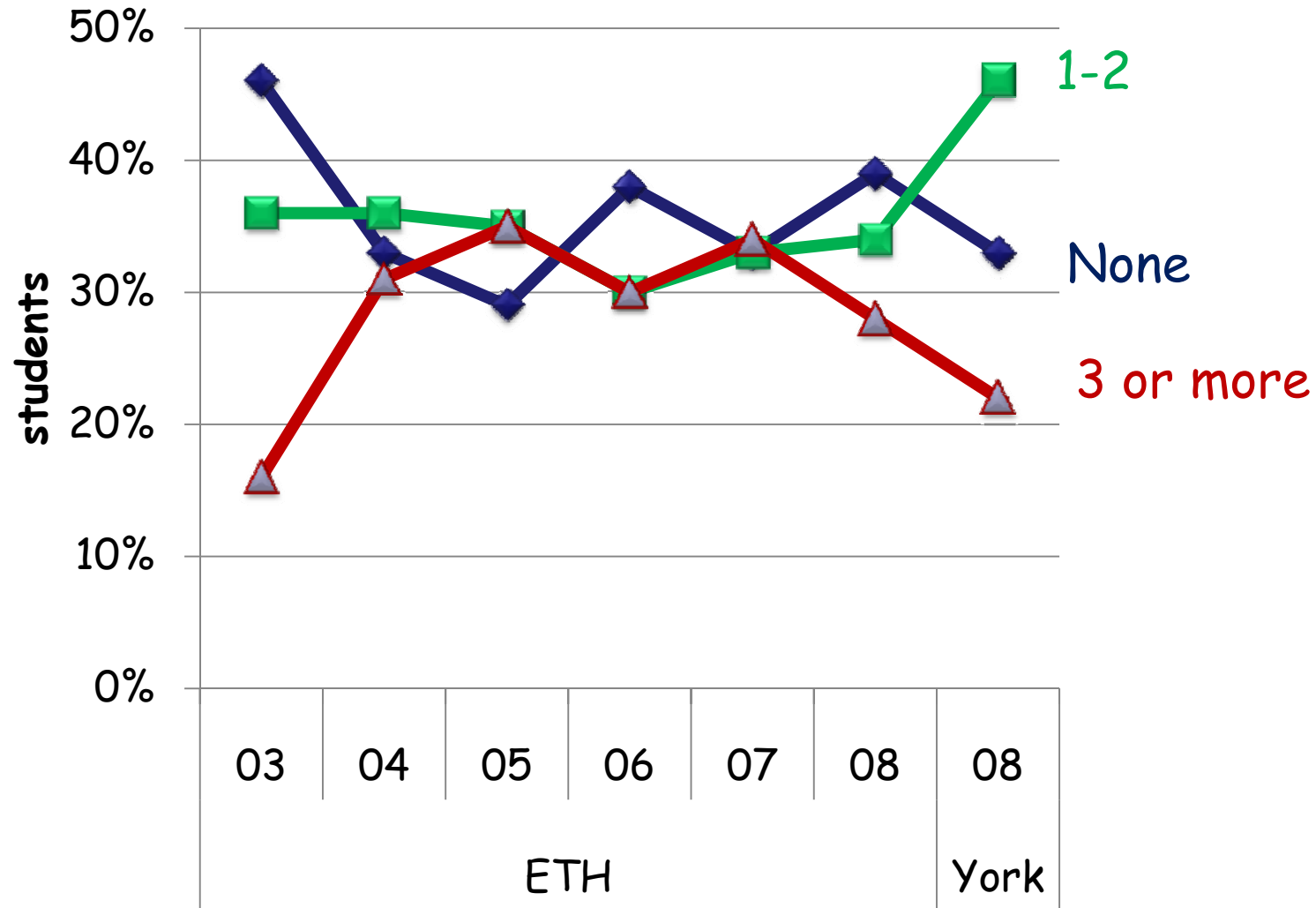
Programming experience



Where learning occurs



Number of languages known well or very well



Languages known by most students



		1 st place	2 nd place	3 rd place
ETH	2003	Basic	Pascal	C++
	2004	Eiffel	C++	JavaScript
	2005	C++	Java	PHP
	2006	PHP	JavaScript	Java
	2007	PHP	Java	JavaScript/C++
	2008	PHP	C++	C
York	2008	VisualBasic	JavaScript	PHP

Comparisons



Changes over the years (ETH only)

- Many differences between 2003 and later years: In 2003, less exposure to computers, less programming experience, less languages known well/very well
- Only punctual differences involving other years: Laptop, specific programming languages (Basic and Eiffel)

Situation is stable

York vs. ETH (2008 only)

- Only punctual differences
 - BSD operating system, computer tasks
 - Different knowledge of Java and VisualBasic

Similar at both institutions

Implications on teaching



Students are mostly computer literate, but very diverse

- ~1/3 programming novices
- ~1/3 know one or two languages well or very well
- ~1/3 know more than two languages

Situation is stable and similar at two institutions

Is this a global phenomenon? Need more data...

Develop measures to adapt to diverse student body

- Teaching methodology: software framework, programming language choice, relate to prior knowledge
- Extra lessons for novices (e.g. CS0)
- Making student groups
- Individualized instruction



A complementary experiment

How are we doing?

Test in 2nd year, programming questions; first experience in February 2009

Language-independent, but uses programming language taught in introductory course

Analysis: 3 equal categories

Will do it again in February 2010



If you are willing to participate in the studies,
please write to pedronim@inf.ethz.ch