A Survey of Introductory Programming Courses in Ireland

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Motivation

- Map the Introductory Programming (CS1) landscape in Ireland
  - Spring 2018

- Serve as a baseline:
  - National Computer Science senior cycle (high school) curriculum (non-compulsory) pilot began September 2018
    - Computing intake at third level could change soon
  - These students won't be in university until September 2020

- Allow comparison between Irish CS1 landscape and other countries, particularly UK and Australasia where recent surveys have been conducted

Motivation

- I Teach CS1

- I Research CS1

- External Expert to Dept. of Education Committee on second-level curriculum (specifically teacher-training subgroup)

- I Teach graduate program for second-level teachers (to teach computing)

- More…

Background

3.6 million sheep

Whiskey exports €0.6 billion

- Ireland is small in terms of population at 4.8 million
  - New Zealand is also 4.8
  - Scotland is 5.6

30 million sheep

30m >> 3.6m

Whiskey exports £2.4 billion

That is a strikeout e

£2.4 >> €0.6

- Possible to get almost complete picture of national activity
  - However, there might be 'group think' happening?

Approach

- UK survey generously provided by those authors (see paper)
  - Based on Australasia survey – whose authors are also very generous (see paper)

- Emailed survey to Irish Third-Level Computing Forum (meeting of all public HE heads of Computing schools/faculties

- Emailed and talked to direct contacts (including private colleges)

Coverage

- At time of survey Ireland had 7 universities, 14 institutes of technology (IoTs) and a handful of smaller private colleges*.

- Responses from the instructors of 39 courses at 25 institutions, including 6 of 7 universities, 13 of 14 institutes of technology, and four private colleges.

- This represents **90% of all publicly funded higher education institutions in Ireland**
  - **Plus 80% (four out of five) of the private colleges** recognized by the Higher Education Colleges Association that offer computing degrees.

*Jan 2019: 3 IoTs -> 1 Technological University, so now 8 Universities, 11 IoTs

Coverage

- Did collect information from 2 universities in Northern Ireland

- Did not include as these are covered in UK surveys

- Also, plans to do international survey (more later)

6 University
13 Institute of Tech
4 Private College
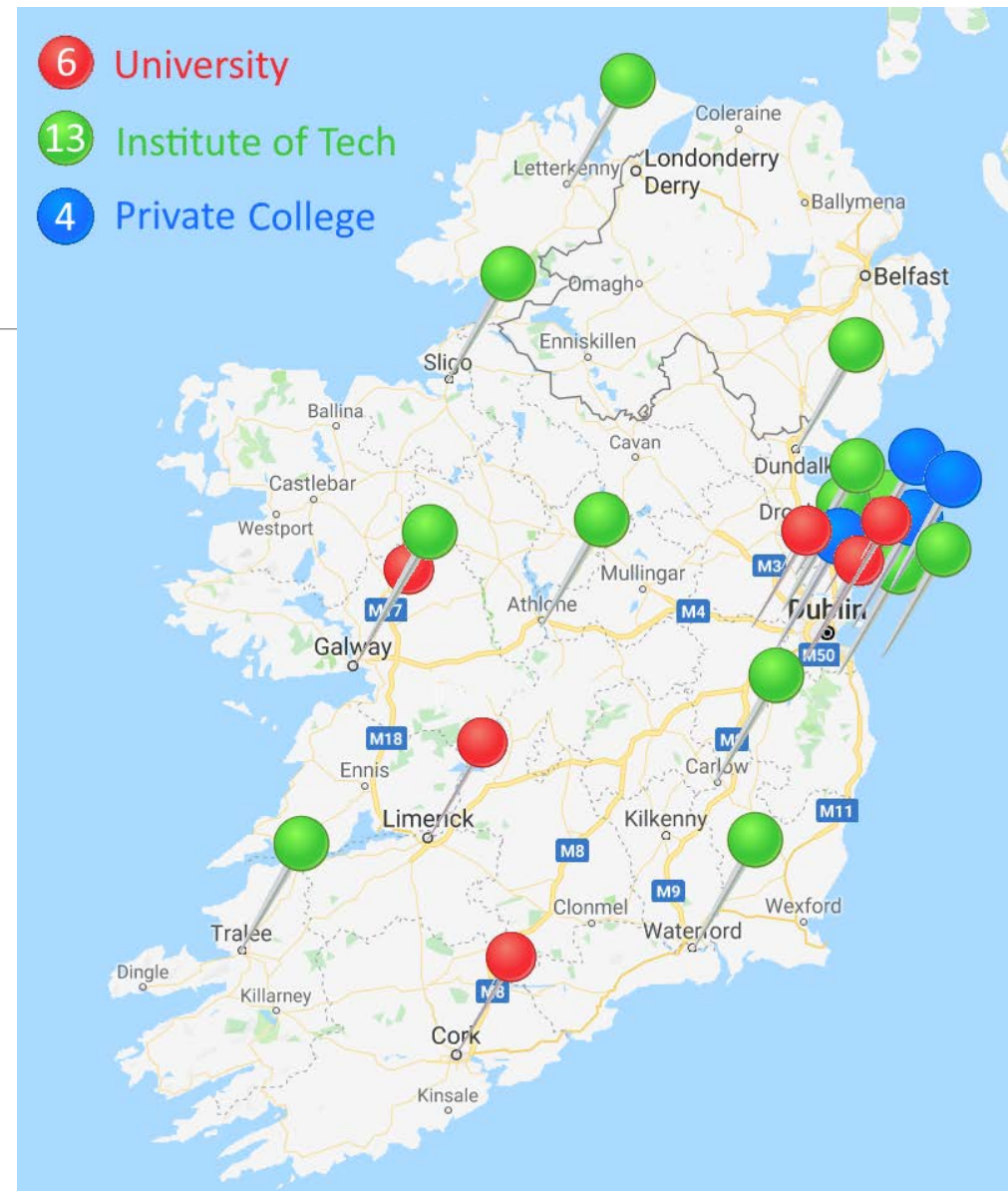
CS1 in Ireland (Overview)

Course titles (for fun)

Computer Programming	Programming Essentials	Programming 2
Introduction to Programming 1 using C#	Software Development 1	Introduction to Programming I
Introduction to Programming	Algorithmic Programming 2	Fundamentals of Programming
Programming	Computer Prgramming II	Programming
Software Development	Programming	Procedural Programming
Software Development (Mobile Apps & Connected Devices)	Computer Programming	Programming 1
Introduction to Programming	Introduction to Computer Science I	Fundamentals of Programming
Introduction to Programming	Programming & Algorithms 1	Introduction to Programming
Programming	Programming Fundamentals 1	Computer Programming I
Software Development	Introductory Programming in Python	Introduction to Programming
Software Development 1	Introduction to Programming	Computer Software 1
Graphical User Interface and Web Development	Programming Fundamentals 1	Structured Programming 1
Principles of Programming	Introduction to Programming	

CS1 in Ireland (Overview)

- 82% have no prerequisites, 18% do have prerequisite(s)

- 87% required for Computing majors, 13% not
  - 67% restricted to majors, 33% open to other majors, 10% for non-majors only

74% are classified as CS1 by Guo's definition (first programming course that has no prerequisites, and is required for computing majors)
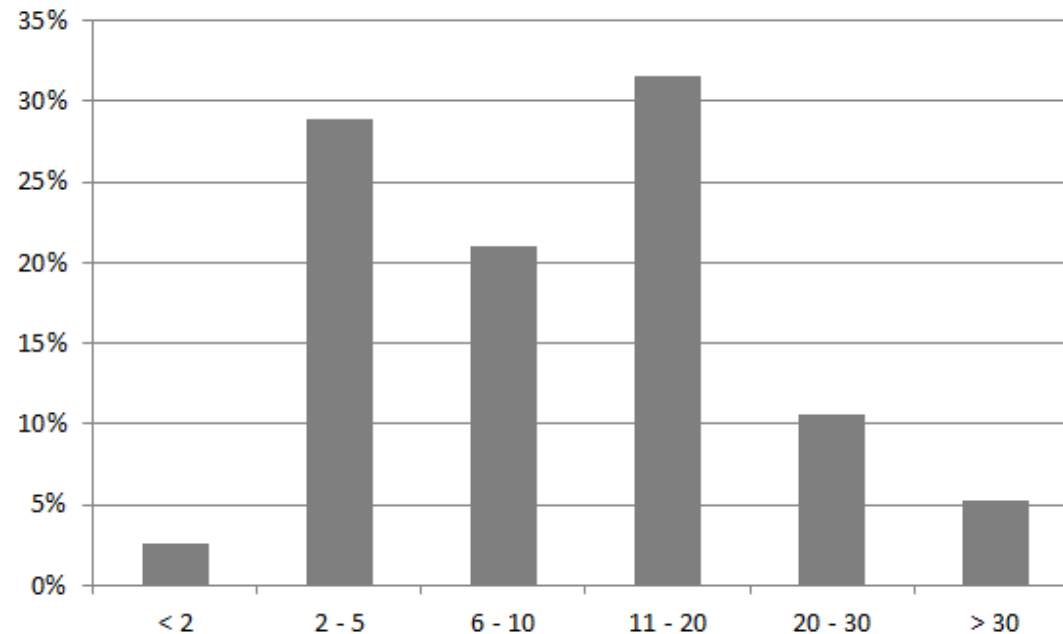
CS1 in Ireland (Overview)

- Average attendance: 123 (min 30, max 400)

- 54% in semester 1 (fall), 13% in semester 2 (spring), 33% year-long

- 5% offer external delivery*

*options for course where students are not required to attend regular lectures, workshops, labs or tutorials

CS1 in Ireland (Overview)

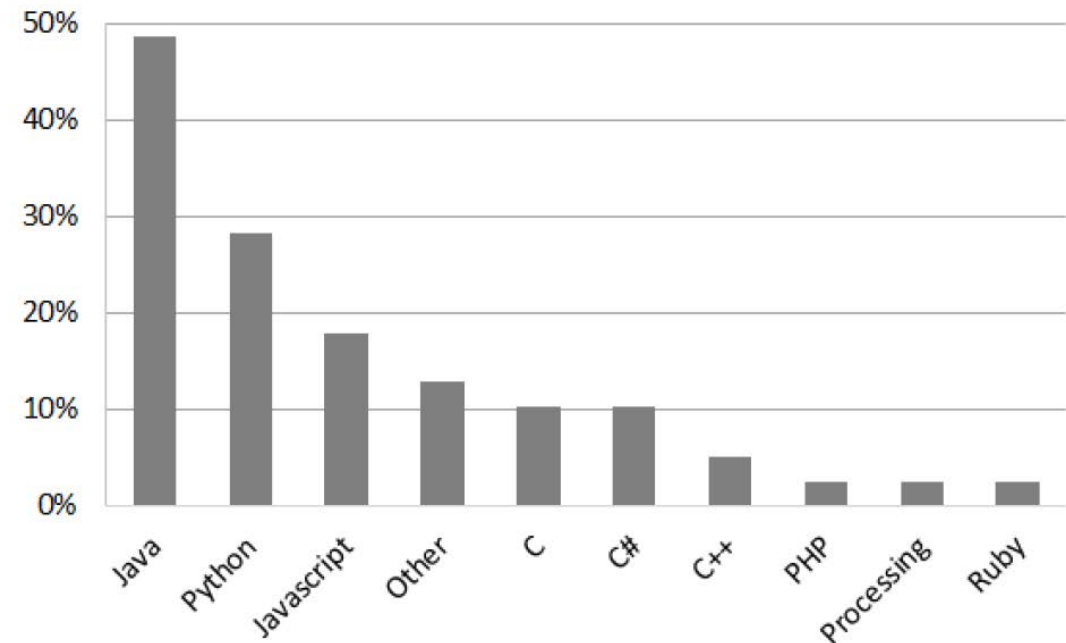- Percentage of experience of instructors
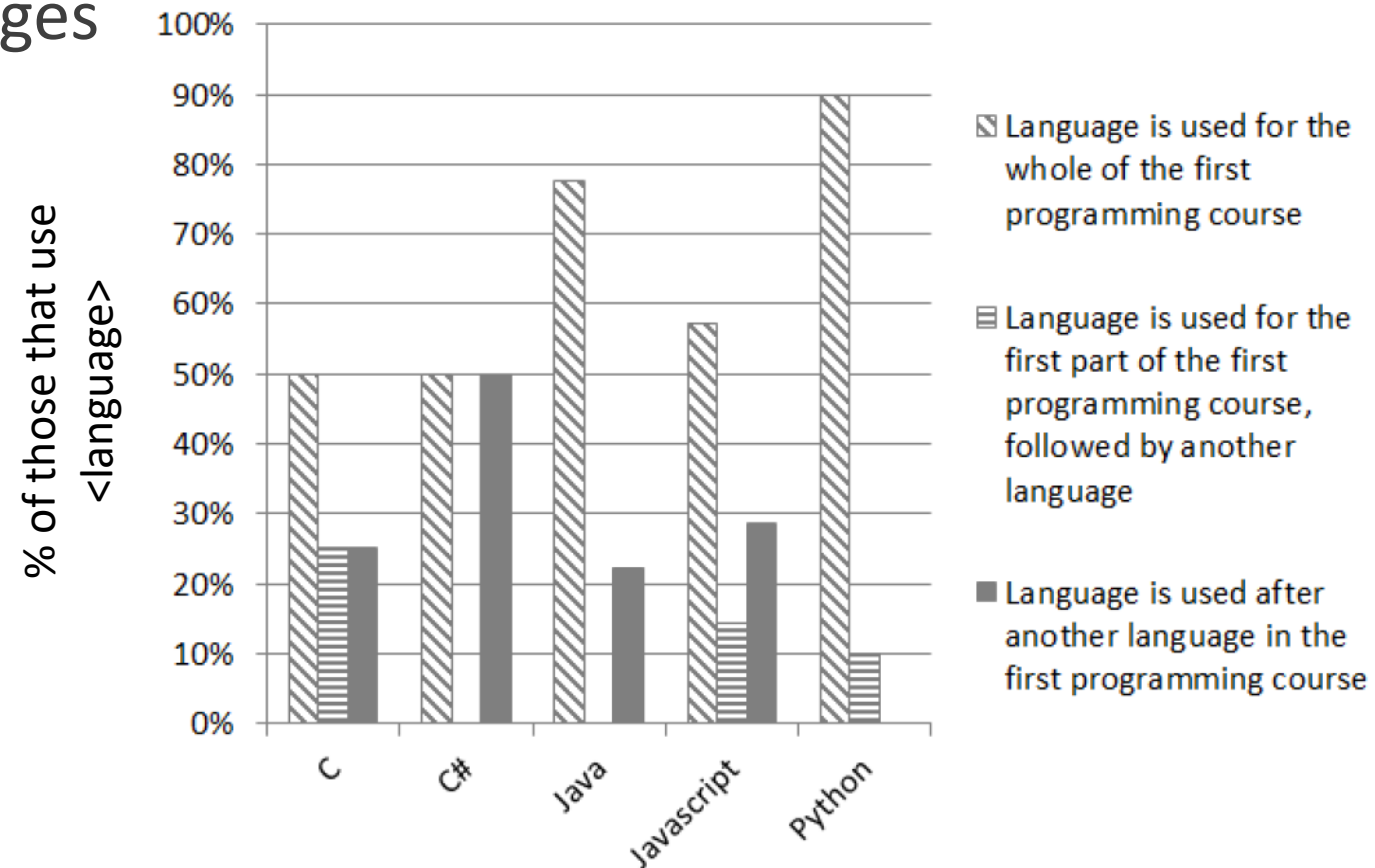
CS1 in Ireland (Languages)

- Paradigms

Paradigm	%
Object-Oriented	43
Procedural	23
Functional	15
Logical	8
Other / mixed	8
No particular paradigm	5

- Languages

CS1 in Ireland (Languages)

- Multiple languages

% of those that use <language>

Legend:
- Language is used for the whole of the first programming course
- Language is used for the first part of the first programming course, followed by another language
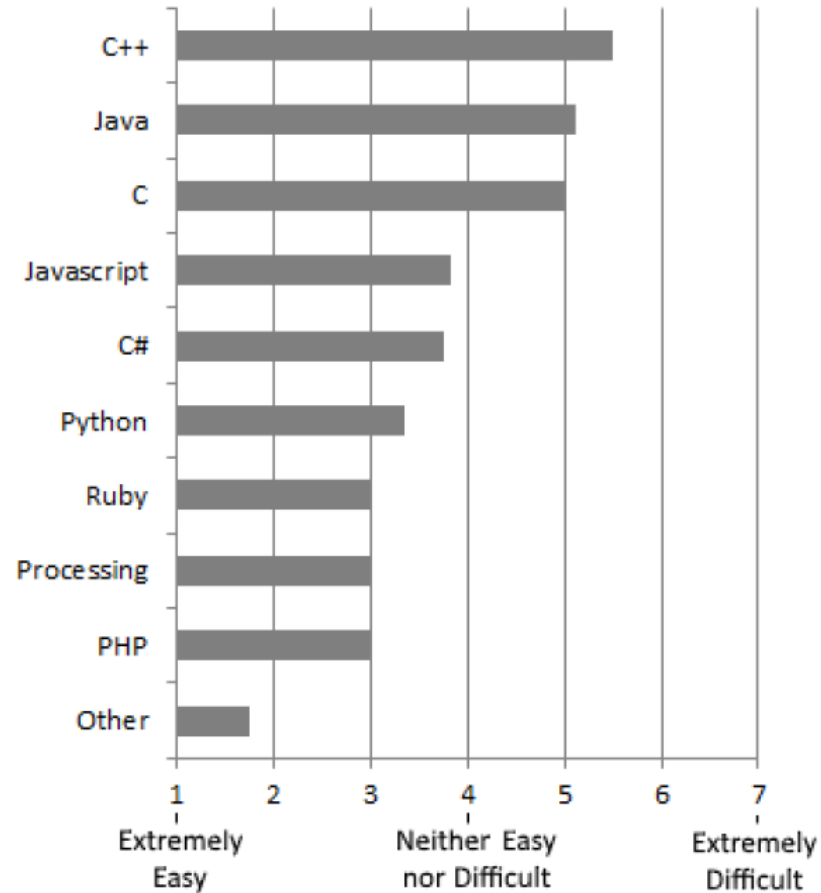- Language is used after another language in the first programming course

CS1 in Ireland (Languages)
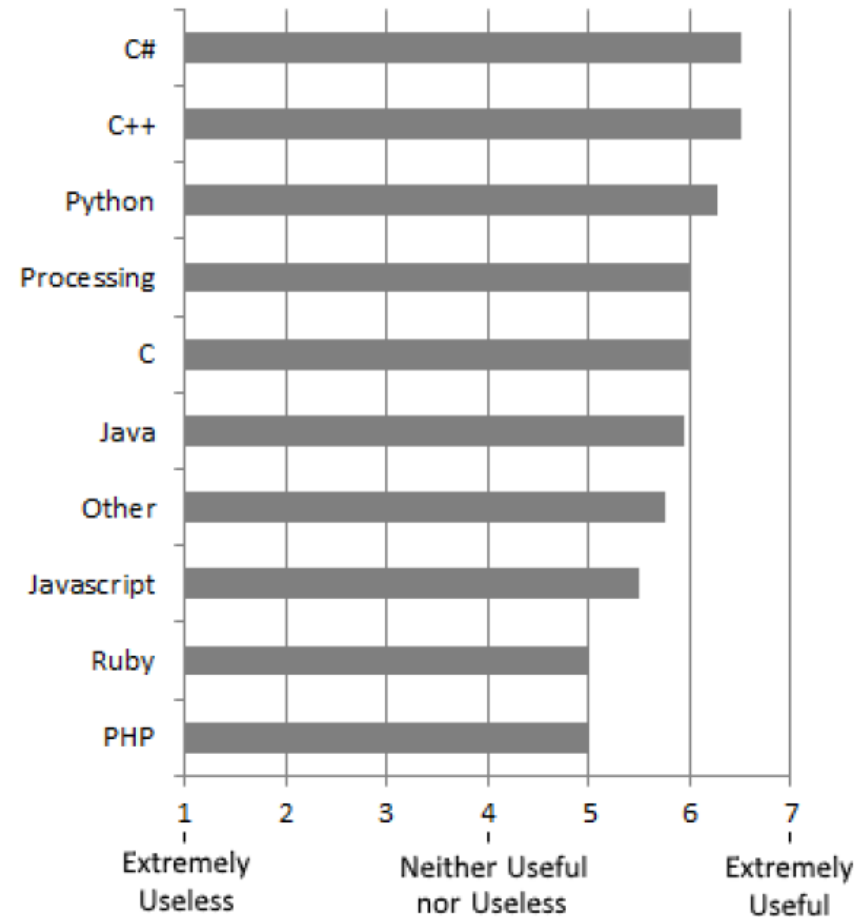
- Why are languages chosen?
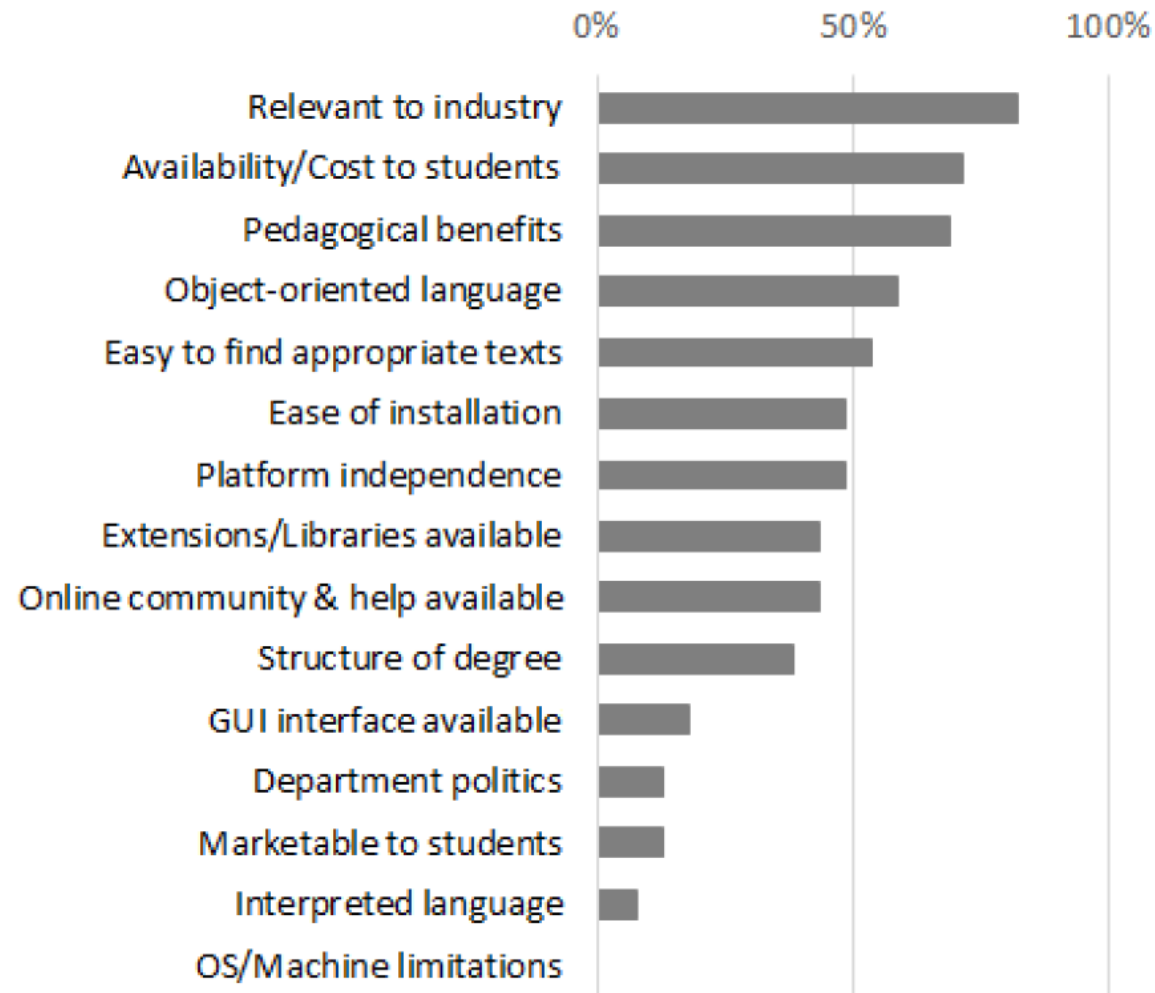
CS1 in Ireland (Languages)

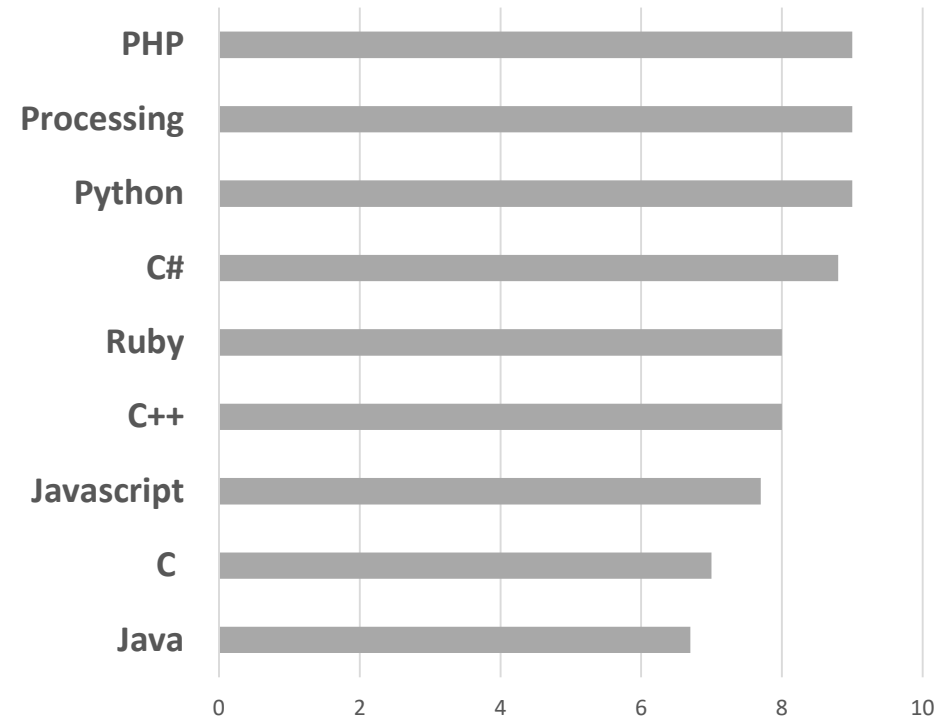- Perceived difficulty to learn
- Perceived usefulness for teaching

CS1 in Ireland (Languages)

- Ease of Learning + Usefulness for Teaching
  - Derived from last slide
  - A bit "back of the envelope"

Ease of Learning + Usefulness for Teaching

CS1 in Ireland (Instructor Viewpoints)

- The following seem to be problematic:
  - language and environment choice
  - student engagement and interest
  - difficulty with programming, specifically with how students relate to the context of computer programming
  - teaching to large numbers of students
  - assessment (e.g. theory and paper-based exams vs lab-based practicalability)
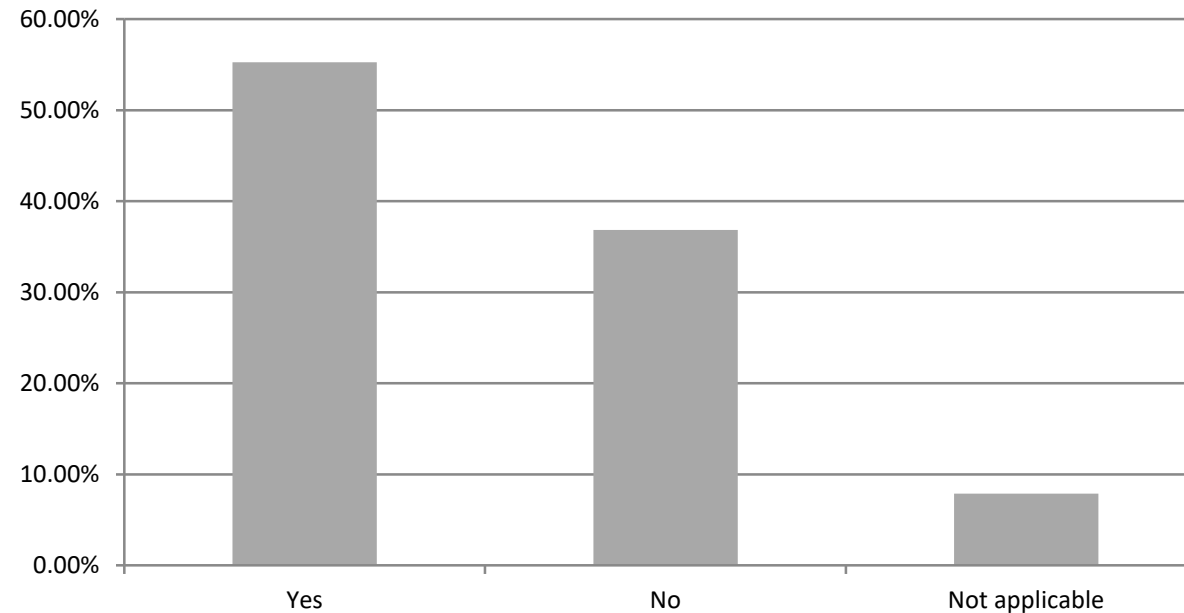 - teaching resources, including lab assistants

Bonus Data for ITiCSE Aberdeen Attendees

% of courses providing named resources
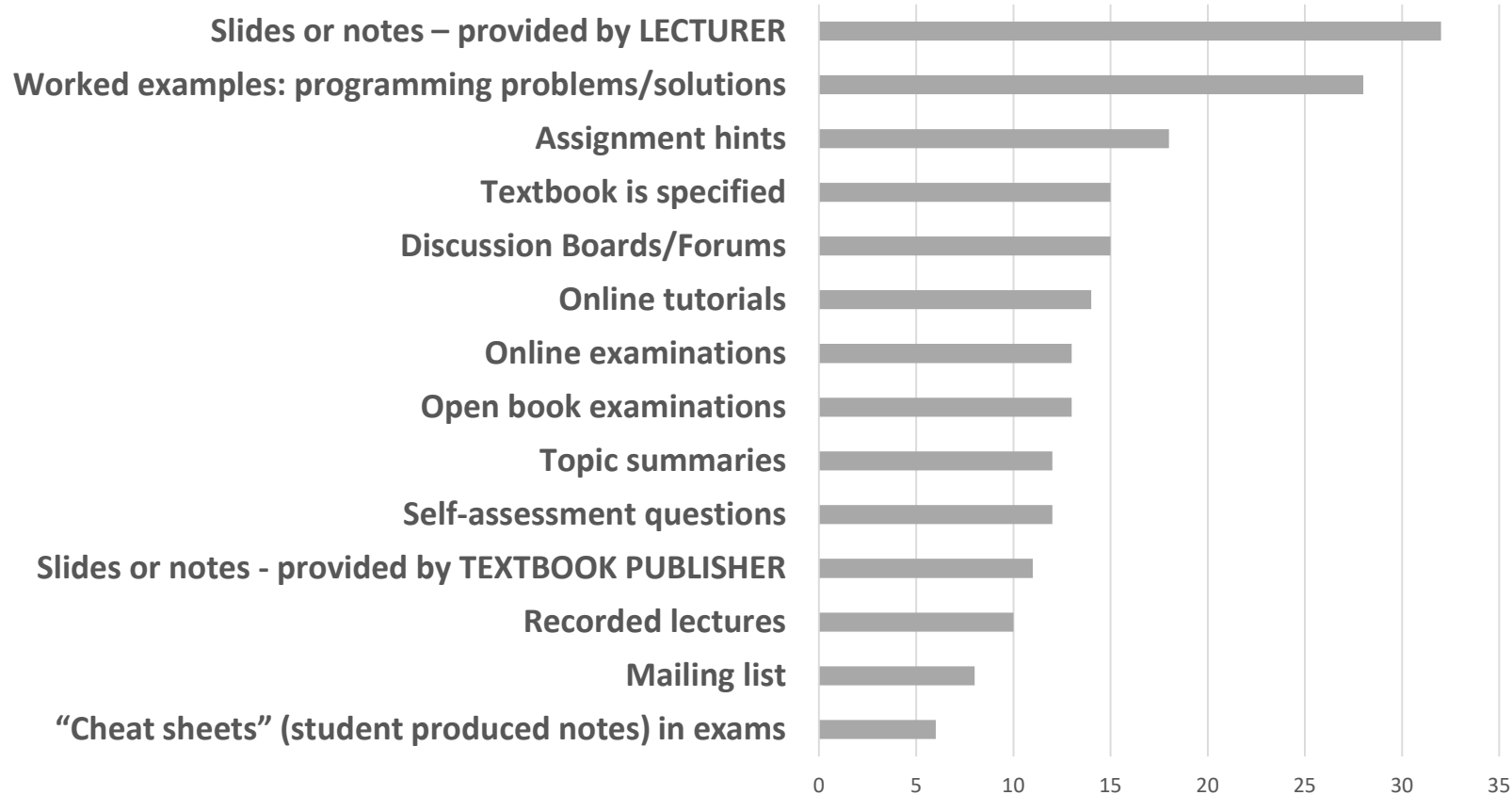
Bonus Data for ITiCSE Aberdeen Attendees

Do you encourage students in this first programming course to use environments and/or tools beyond simple text editors and command line compilers?

Bonus Data for ITiCSE Aberdeen Attendees

Faculty delivering CS1 | number of faculties | % overall

	number of faculties	% overall		number of faculties	% overall
Computing	10	32%	Computing, Engineering & Intelligent Systems	1	3%
Computer Science	3	10%	Computing & Mathematics	1	3%
Engineering & Design	1	3%	Electronic & Electrical Engineering & Computer Science	1	3%
Computing & Creative Practices	1	3%	Computing Science & Mathematics	1	3%
Film, Art & Creative Technologies	1	3%	Engineering	1	3%
Information Technology	1	3%	Informatics & Engineering	1	3%
Computer Science & Applied Physics	1	3%	Informatics & Creative Arts	1	3%
Science	1	3%	Electronic & Computer Engineering	1	3%
Business & IT	1	3%	Business, Computing & Humanities	1	3%
Business & Law	1	3%	Computing Science & Mathematics	1	3%

42% of courses are within a "Computing" OR "Computer Science" faculty.

Conclusions

- Ireland is small in terms of population (<5 million)
  - Possible to get almost complete picture of national activity
  - However, there might be 'group think' happening in some areas?

- There are issues, but no findings indicated that they are particularly specific to the Irish context.
  - At second level this would most likely be quite different.

Future Work

- Teaming up with UK & Australasia efforts to paint a larger, more generalisable picture

- Repeat this survey in Ireland in 2? 3? years

- Play my part to support second-level curriculum roll-out

Acknowledgements

- Ellen Murphy and James Davenport (University of Bath)

- Tom Crick (Caridff Metropolitan University)

- Raina Mason and Graham Cooper (Southern Cross University)

- Simon (University of Newcastle)

- Ted Parslow (Irish Third-level Computing Forum)

- Many heads of faculty

- Respondents