

Third Level Computing Forum

September 25, 2019

Brett Becker (UCD)

```
public class HelloWorld {  
    public static void main(String[] args) {  
        System.out.println("Hello World");  
    }  
}
```

Computer Science Education Research in Ireland

Section A – Computing Education Research: ACM SIGCSE & Ireland

Compulsory

For perspective

- I'm interested in Introductory Programming, specifically
 - Novice programmer behaviour
 - Compiler Error Messages
 - Novice interaction with programming environments
 - National and ~~international~~ global trends
 - Global *issues*
 - How is learning programming different for non-native English speakers?
 - See [46] at brettbecker.com/publications
 - Communities
 - Particularly SIGCSE and its sub-communities...

CSER* in Ireland

- *I prefer Computing Education Research to Computer Science Education Research but that doesn't really matter too much...
- Ireland does surprisingly well
 - Ireland is 14th globally in SIGCSE Technical Symposium publications (2010-18) *and this is going to get better...*
 - 9th in ICER papers (2005-15) *this is probably higher now...* Per capita, 2nd.

SIGCSE (the ACM Special Interest Group on Computer Science Education) [sigcse.org]

- Third largest SIG (of 37) with 2,882 members.
- Second oldest (just celebrated 50th anniversary)
- Four main conferences (>7,000 ACM publications):
 - **SIGCSE Technical Symposium** (normally called "SIGCSE"): 51 years old, annual (Feb/Mar) historically always in USA but 2021 will be in Toronto, Canada. Attendance ~1800. **2020 is Portland Oregon, March 11- 14.** B Becker is International Liaison. BB and K Quille are Associate Program Chairs. sigcse2020.sigcse.org
 - **ITiCSE**: 25 years old, annual (June/July) Europe. Attendance ~250. **2020 Trondheim, Norway, June 17-19.** BB is APC. iticse.acm.org.
 - **ICER**: 15 years old, annual (Aug/Sept) N.America -> Europe -> N.America -> Aus/NZ (repeat) Attendance ~200. **2020 is New Zealand, August.** BB is on Program Committee. icer.acm.org
 - **CompEd**: 1 year old, every 2 years (any time of year), NOT N.America or Europe. Attendance ~150. **2021 is ?** B Becker is Steering Committee Chair. acmcomped.org

SIGCSE (the ACM Special Interest Group on Computer Science Education) [sigcse.org]

- Other affiliated conferences such as
 - Koli Calling (kolicalling.fi) Always in November in Finland
 - Australasian Computing Education Conference (ACE, aceconference.wordpress.com) Always late January
 - UK Computing Education Practice (CEP), **Jan 9 2020, Reading UK**
<http://community.dur.ac.uk/cep.conference/2020/index.php>
 - UK & Ireland Computing Educating Research Conference (UKICER), few weeks ago, **Kent UK. September 2020?**
<https://www.cs.kent.ac.uk/events/2019/UKICER2019/index.html>
- I have >100 more slides on CER and SIGCSE at brettbecker.com/talks
 - See the data science talk at the top (it's not really on data science)

SIGCSE (the ACM Special Interest Group on Computer Science Education) [sigcse.org]

- Local chapters:

- Australasia
- China
- India
- Jataí (Brazil)
- UK

- **Ireland!**

Ireland ACM SIGCSE Chapter (SIGCSEire)

- The mission of the Ireland ACM SIGCSE Chapter is to:
 - Provide a forum to promote Computing Education in Ireland at all levels of education.
 - Promote Computing Education research, practice and positively influencing equality, diversity and inclusion in computing.
- Support (pre-charter) from 60 contacts in almost all HEIs (including private colleges) + industry.
- We would like members from every HEI in Ireland.

Ireland ACM SIGCSE Chapter (SIGCSEire)

- Mailing list
- One “large” meeting per year with one or two others
 - Will roam the country
- Open to all with interest in Computing Education: Third-level lecturers, students (of adult age), primary and second-level teachers, principals, government and industry members, coding club members, etc. are welcome.
- Northern Ireland-based people are more than welcome to join Ireland and UK chapters. Anyone can join Irish chapter if they have a legitimate cause.
- No dues. No need to be SIGCSE or ACM member.

Ireland ACM SIGCSE Chapter (SIGCSEire)

- Membership applications open very soon. Please stay tuned to TLCF emails
 - Please circulate in your departments when you get the word!
- Save the date!
 - December 11 (afternoon/evening) @UCD
 - Chapter launch
 - Co-located with INGENIC (Irish Network for Gender Equality in Computing) event (see next slide)
 - Speakers:
 - Prof Amber Settle (DePaul U, USA), past-SIGCSE Chair
 - Dr Paul Dickson (Ithaca College, USA)

The Irish Network for Gender Equality in Computing (INGENIC) promoting gender balance through 3rd level collaboration

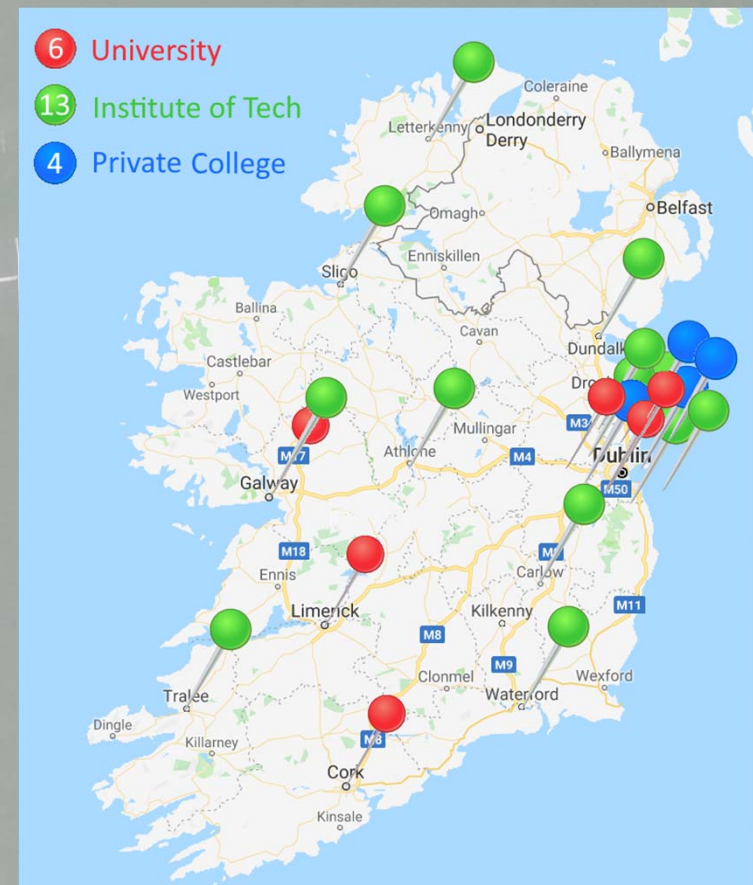
- INGENIC.ucd.ie
- Founded by Dr Susan McKeever (CS@TU Dublin) and Dr Catherine Mooney (CS@UCD) in 2017 in response to what they saw as a need to coordinate efforts to address Gender Equality in Computing across all third level institutions in the Republic of Ireland.
 - Help increase the enrolment of females on third level computing programmes.
 - Improve the experience of female students in computing programmes.
 - Identify and develop supports for staff development in line with national and international recommendations for improving gender diversity and equality.
 - Support collaborative approaches to address their aims.

Section B – Recent Research in CER (much of it, in Ireland)

Select any 1 of 1 questions.

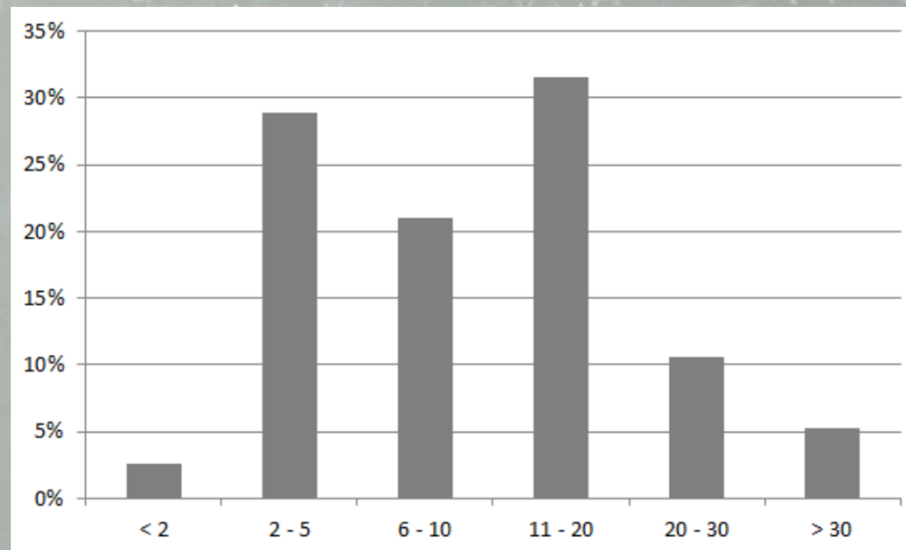
A Survey of Introductory Programming Course in Ireland (ITiCSE 2019)

- Map CS1 landscape in Ireland
- Average attendance 123 (min 30, max 400)
- 54% sem1, 13% sem2, 33% year-long
- 5% offer external delivery*



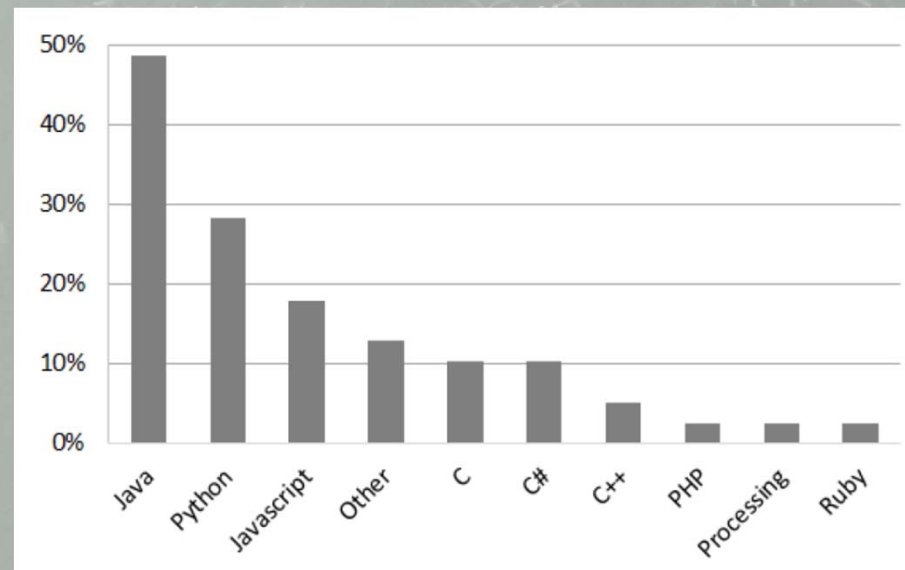
CS1 in Ireland (Overview)

- Percentage of experience of instructors



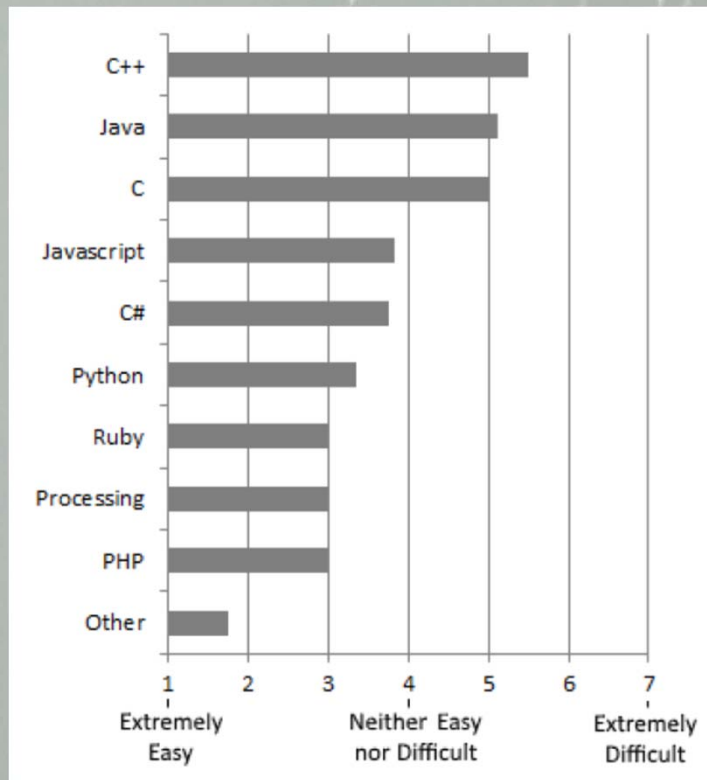
CS1 in Ireland (Overview)

- Languages – Java 49%, Python 28%. Remember these numbers.

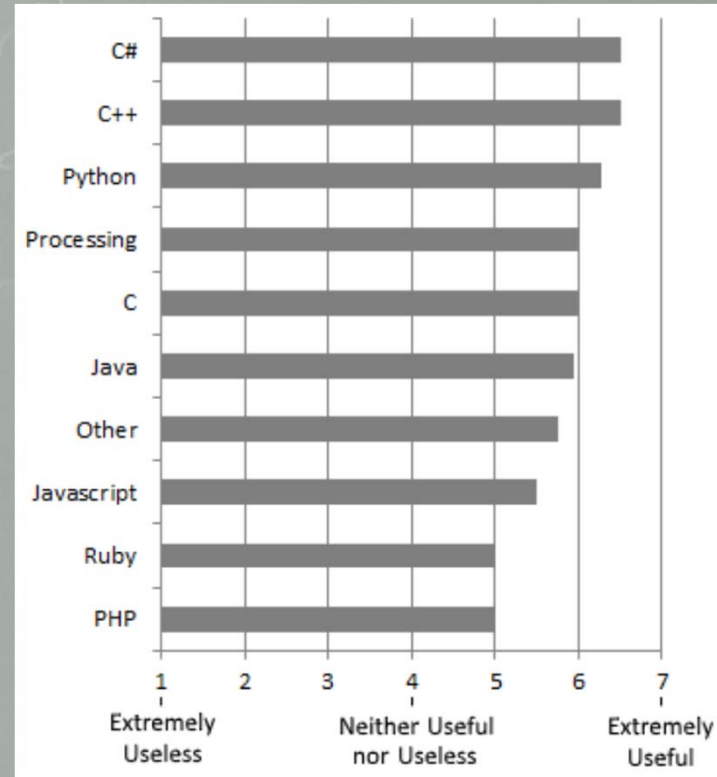


CS1 in Ireland (Languages)

Perceived difficulty to learn



Perceived usefulness for teaching



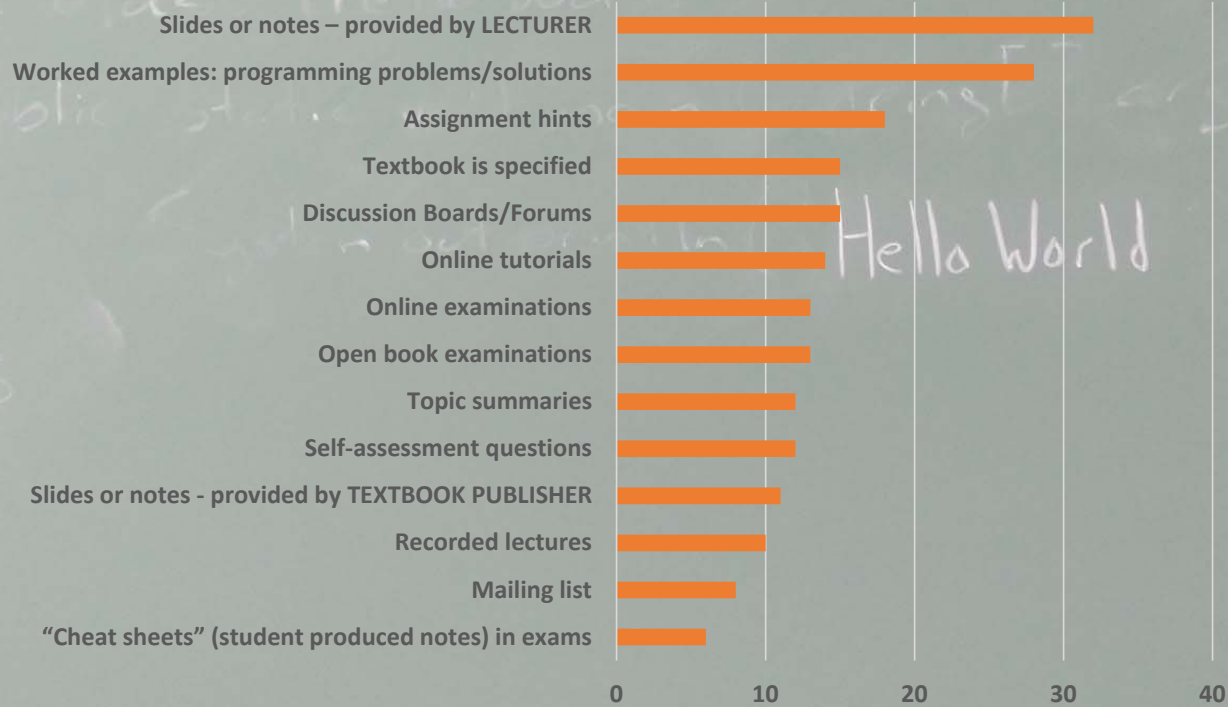
CS1 in Ireland (Instructor Viewpoints)

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

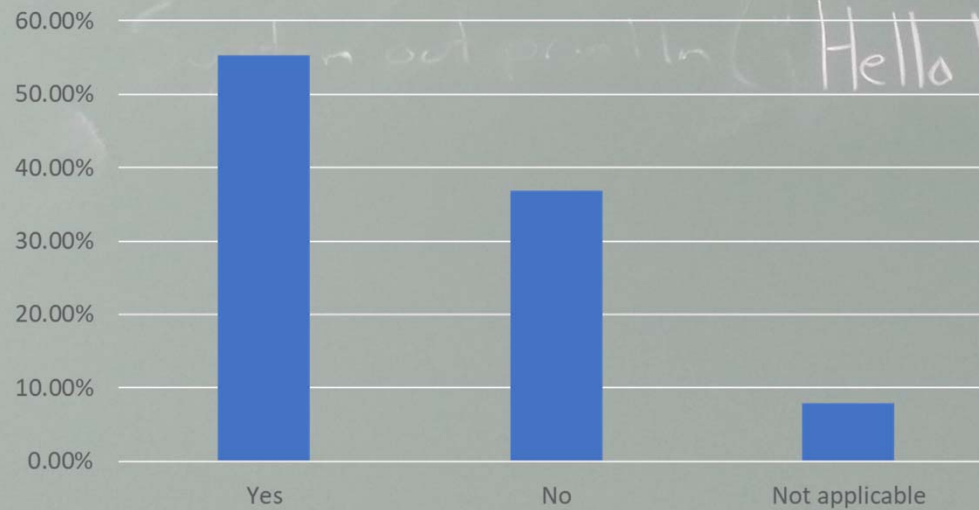
Bonus Data for TLCF

% of courses providing named resources



Bonus Data for TLCF

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 TLCF

Faculty delivering CS1 | number of faculties | % overall

Faculty	number of faculties	% overall
Computing	10	32%
Computer Science	3	10%
Engineering & Design	1	3%
Computing & Creative Practices	1	3%
Film, Art & Creative Technologies	1	3%
Information Technology	1	3%
Computer Science & Applied Physics	1	3%
Science	1	3%
Business & IT	1	3%
Business & Law	1	3%

Computing, Engineering & Intelligent Systems	1	3%
Computing & Mathematics	1	3%
Electronic & Electrical Engineering & Computer Science	1	3%
Computing Science & Mathematics	1	3%
Engineering	1	3%
Informatics & Engineering	1	3%
Informatics & Creative Arts	1	3%
Electronic & Computer Engineering	1	3%
Business, Computing & Humanities	1	3%
Computing Science & Mathematics	1	3%

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

A Survey of Introductory Programming Courses in Ireland (ITiCSE 2019)

- I have plans to develop a unified survey with UK and Australasia (possibly globally) and roll this out within 2 years.
- I'll be asking for your help!

What Do CS1 Syllabi Reveal About Our Expectations of Introductory Programming Students?

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- Surveyed websites of 916 institutions globally looking for CS1 modules
- Ireland was 5th most frequent (and I didn't do that)
- Java 49% (Ireland was 49%), Python 24% (Ireland was 28%).
- What countries had highest % *explicit learning outcomes*? Ireland, NZ, Wales (all 100%).
- Much, much more
- All the data is available, searchable, sortable, downloadable
 - <http://csed.ucd.ie/sigcse2019>

50 Years of CS1 at SIGCSE: A Review of the Evolution of Introductory Programming Education Research

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- Surveyed 777 CS1 papers at SIGCSE, 1970-2018.
- Ireland was 5th most frequent (and I didn't do that)
- Java 49% (Ireland was 49%), Python 24% (Ireland was 28%).
- What countries had highest % *explicit learning outcomes*? Ireland, NZ, Wales (all 100%).
- Much, much more
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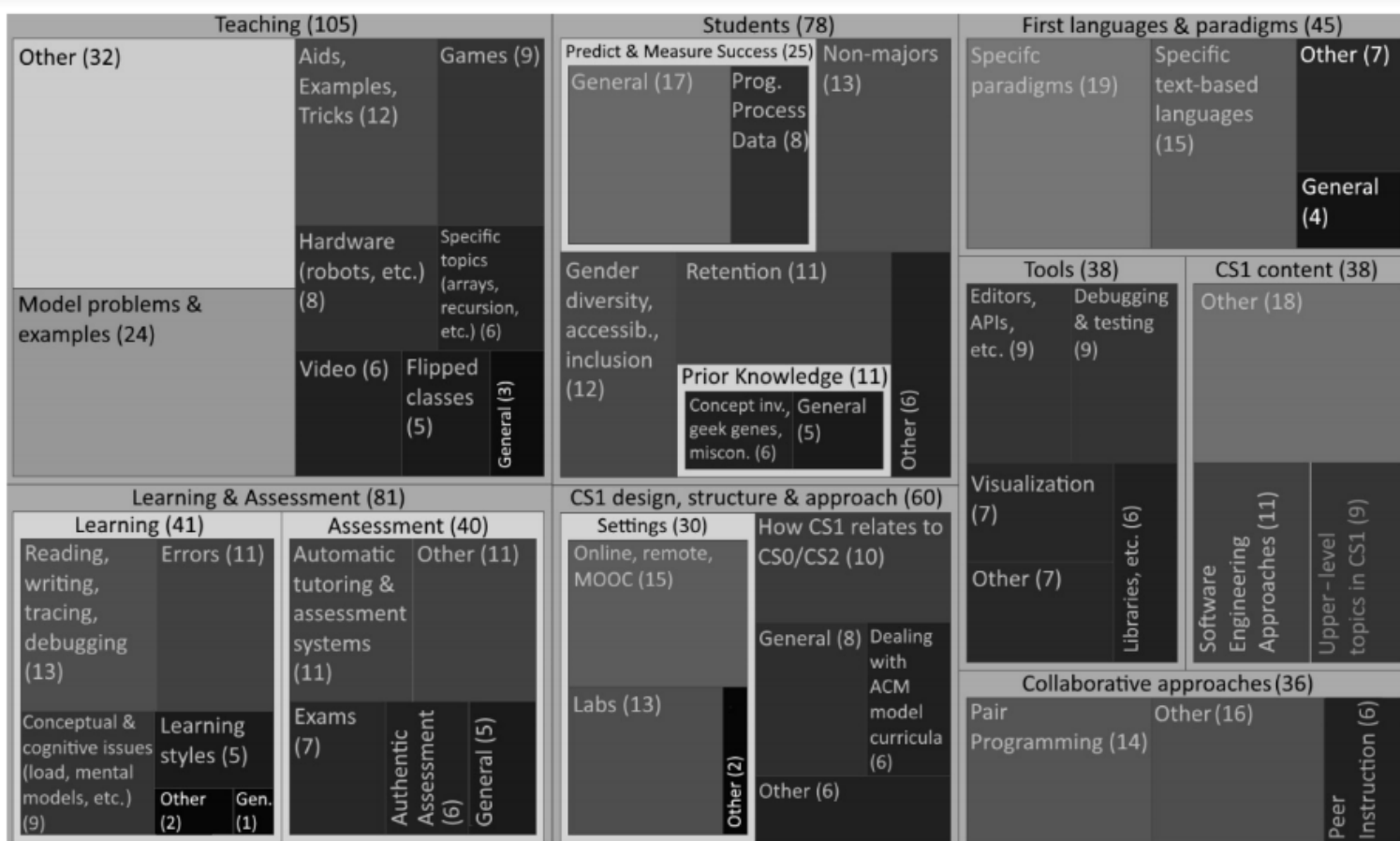


Figure 1: Treemap of 481 papers in 8 categories and 54 subcategories. The area of each rectangle is proportional to the number of papers in each topic area. More details are discussed in Section 5.

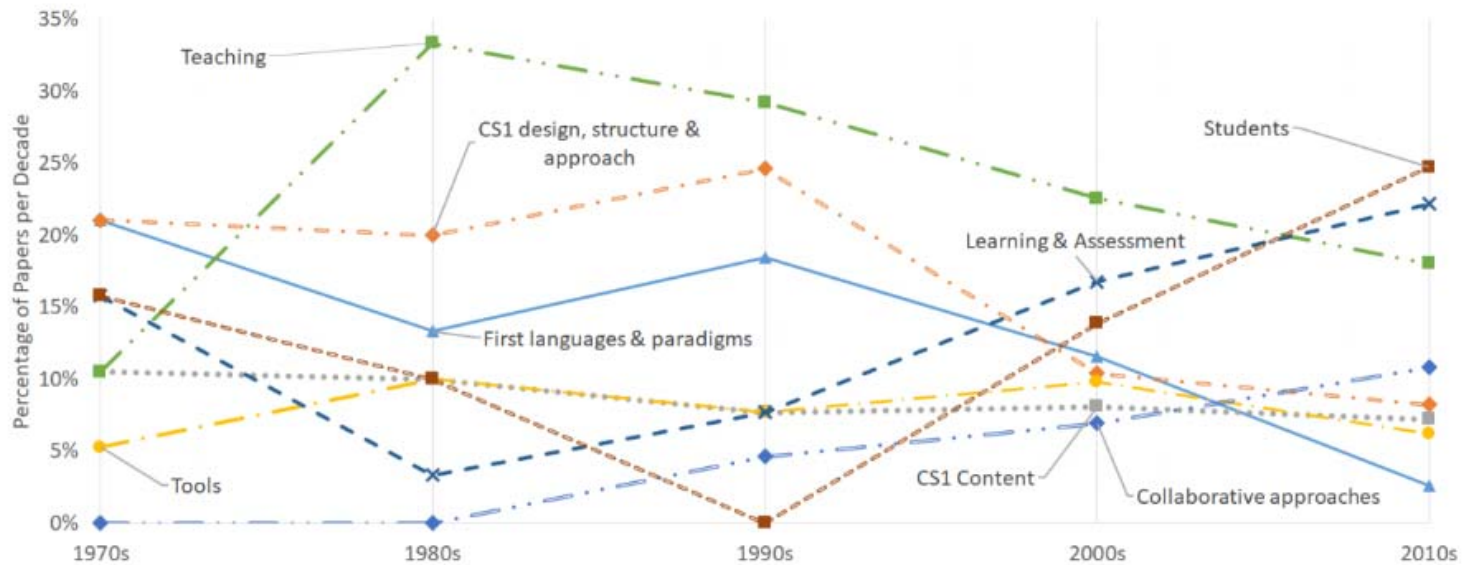


Figure 2: 50-year trends of the 8 top-level categories in introductory programming at the SIGCSE Technical Symposium. To compensate for the fact that the overall number of papers published in each decade has steadily increased, we normalized the number of papers per decade by dividing the number of papers per top-level category in each decade by the total number of papers in our dataset published in each given decade.

- ITiCSE 2018 working group
- 5,056 Intro to Programming papers 2003-2017
- 32 pages of discussion
- 735 papers actually referenced
- Want to join us in 2027?

Introductory Programming: A Systematic Literature Review

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Finally!

- I'm looking to take on some PhD students. Feel free to contact me or send people my way.
- In particular, lecturers that want to get PhDs (with interests that align with mine)