# METRECC Instrument: sharing and contributing to international K-12 computing curricula and experiences.

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#rpfseminars

**Raspberry Pi Computing education research seminars**

**Keith Quille** @KQuille · Sep 6

"Hello you with the pretty face, welcome to the human race" - ELO. Hello world.... Charlie (Jacob) Quille born on the 4th September at 17.08 weighing 8 lbs. I could not be a prouder dad to Charlie and husband to my amazing wife and hero @faithwhelan.


58 5 199

# Recommended pre-reading:

## ITICSE WG report

Falkner, K., Sentance, S., Vivian, R., Barksdale, S., Busuttil, L., Cole, E., … Quille, K. (2019). An International Study Piloting the MEasuring TeacheR Enacted Computing Curriculum ( METRECC ) Instrument. In ITiCSE-WGR ’19: Proceedings of the Working Group Reports on Innovation and Technology in Computer Science Education (pp. 111–142).

https://dl.acm.org/doi/abs/10.1145/3344429.3372505

# Introduction

# Agenda

- **Introduction**
  - What and how we gathered and why
- **Related Work**
- **The METRECC Instrument**
- **Research Findings**
  - What is happening in schools?
  - Teacher computer science self-esteem
- **Evidence of Reliability and Validity**
- **Extensions and Future**
  - Limitations & future work
  - Repository & sustainability
  - METRECC South Asia
- **Discussion**

# 2019 ITICSE Working Groups

- WG 1: 1.5 Degrees of Separation: Computer Science Education in the Age of the Anthropocene
- WG 2: Fostering Program Comprehension for Novice Programmers – Learning Activities and Learning Trajectories
- WG 3: Pass Rates in Computing and in other STEM Disciplines
- WG 4: Data Science Education: Global Perspectives and Convergence
- WG 5: A Periodic Table of CS Education Learning Theories: Is it possible, is it useful, and what forms could it take?
- WG 6: An International Benchmark Study of K-12 Computer Science Education in Schools
- WG 7: Toward Developing a Cloud Computing Model Curriculum
- WG 8: Securing The Human: Attracting More, Diverse Students in the Cybersecurity Field
- WG 9: Towards an Ability to Direct College Students to an Appropriately Paced Introductory Computer Science Course
- WG 10: Compiler Error Messages: Difficulties, Design Guidelines and Effectiveness

# Australia, England, Ireland, Italy, Malta, Scotland and the United States


Inverness
Aberdeen
SCOTLAND
Dundee
Edinburgh
Glasgow
United Kingdom
NORTHERN IRELAND
Isle of Man
Great Britain


Dyce
A96
Bridge of Don
Aberdeen
Cove Bay
Aberdeen
City in Scotland

# 2019 ITICSE Working Group

# Related Work

# K-12 CS Education

- A number of country/national reports on K-12 CS curriculum landscapes have emerged from Europe (e.g. Balanskat & Engelhardt, 2014), the UK (The Royal Society, 2012, 2017), US (Hai Hong et al. 2016), Wales (Moller & Crick, 2016) and Poland (Maciej, 2015),
- There have been dedicated special journal issues toward case studies in K-12 CS (Hubwieser et al., 2015).
- 2011 ITiCSE Working Group reviewed secondary CS curricula from different countries and developed a category system, the Darmstadt Model (Hubwieser et al., 2011).
- 2013 Working Group examined trends in K-12 schools by 22 surveying experts across countries about their curriculum  (Shulte et al., 2012)

# Curriculum Components

- **Intended**
- **Enacted**
- Assessed
- Learned

Andrew C. Porter and John L. Smithson. 2001. Defining, Developing and Using Curriculum Indicators. CPRE Research Reports, 12-2001. (2001).

# Curriculum components

**Intended**

Policy tools as curriculum standards,frameworks, or guidelines that outline the curriculum teachers are expected to deliver.

**Enacted**

Actual curricular content that students engage in the classroom and pedagogical approaches adopted, and - with particular relevance to CS curriculum - their use of technology, physical computing devices and tools.

# Research Questions

- What are the similarities and differences across countries in terms of intended *CS curriculum topics and programming requirements*?
- To what extent are teachers *addressing the intended CS curriculum with their enacted curriculum* in classrooms?

<u>How can we capture enacted and intended CS curriculum across the world?</u>

# Process

| Review prior work | Develop instrument | Conduct pilot study |
|---|---|---|
| Curating research papers, reports and education survey instruments (many with evidence of validity/reliability). | Systematically developing categories and survey items. Building a survey instrument. | Piloting the survey instrument across 7 working group countries. |

# Process

| Analyze Data | Evaluate Survey | Revise instrument |
|---|---|---|
| Cleaning and analysis of data. Mapping processes for comparing intended and enacted curricula. | Tested for evidence of validity and reliability. Full review of each question by entire group. | Revise survey instrument based on data analysis and evaluation. |

# METRECC Instrument

# Capturing intended versus enacted

- Intended - created template for capturing required curriculum/standards and policies in place for country/state

- Enacted - development of a survey instrument to measure what happens in classrooms from the perspective of teachers

# Capturing the intended Curriculum

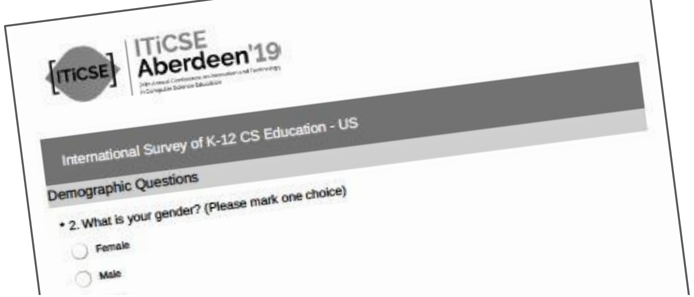
Formal curriculum requirements and supporting contextual information.

| COUNTRY/USA STATE | AUSTRALIA (AUS) | COLORADO (US-CO) | ENGLAND (ENG) | IRELAND (IRL) | ITALY (ITA) | LOUISIANA (US-LA) | MALTA (MLT) | MINNESOTA (US-MN) | SCOTLAND (SCO) |
|---|---|---|---|---|---|---|---|---|---|
| Population (million) | 25.09 | 5.69 | 55.62 | 4.70 | 60.50 | 4.66 | 0.47 | 5.6 | 5.44 |
| No. of schools | 9477 | 1900 | 29972 | 3961 | 8636 | 1426 | 170 | 2066 | 2400 |
| No. Primary schools | | | | 3246 | | | 108 | | 2031 |
| No. secondary schools | | | | 715 | | | 62 | | 359 |
| No. of students | 3893834 | 911536 | 8378809 | 920867 | 8422419 | 722666 | 46247 | 862971 | 693251 |
| No. of teachers (FTE) | 288583 | 59989 | 498100 | 66327 | 872268 | 49196 | 2976 | 57262 | 51959 |
| No. of Primary teachers (FTE) | | | | 36773 | | | | | |
| No. of secondary teachers (FTE) | | | | 29554 | | | | | |
| CS State or country plan | √ | ⊗ | √ | ⊗ | Ø | | | ⊗ | √ |
| CS Curriculum k-6 standards defined | √ | ⊗ | √ | Ø | Ø | | | | |
| CS Curriculum: Y7+ standards defined | √ | √ | √ | ⊗ | Ø | | | | |
| CS Standalone subject | √ | √ | √ | Ø | Ø | | | | |
| CS Formal Reporting | V | ⊗ | ⊗* | ⊗ | Ø | | | | |
| CS in pre-service training Primary | E | E | √ | E | √ | | | | |
| CS in pre-service training Secondary | E | E | √ | E | E | | | | |
| CS training for inservice Primary? | √ | √ | | | | | | | |
| CS training for inservice secondary? | √ | √ | | | | | | | |
| Year endorsed | 2015 | 2018 | 2013/14 | ⊗ | ⊗ | | | | |
| | | | | CSTA Standards co | | | | | |
| Computational Thinking | √ | √ | √ | √ | √ | ⊗ | √ | | |
| Collaboration | √ | Ø | Ø | √ | √ | ⊗ | Ø | ⊗ | √ |
| Computing Practice | √ | Ø | √ | √ | √ | ⊗ | √ | ⊗ | √ |
| Computers, Communication Devices | √ | √ | √ | √ | √ | ⊗ | √ | ⊗ | √ |
| Community | Ø | Ø | NA | √ | √ | ⊗ | Ø | ⊗ | √ |
| Global & Ethical Impacts | √ | √ | √ | √ | √ | ⊗ | √ | ⊗ | √ |

**Yes (√) No (⊗) Additional information (Ø)**
**Pre-service training - Varies(V) Compulsory (√), Elective (E)**
**CSTA standards covered Explicit (√) Implicit (Ø ) Not covered (⊗)**
**Formal reporting on children's attainment in CS.**

| COUNTRY/USA STATE | AUS | | | US-CO | | | ENG | | | IRL | | | ITA | | | US-LO | | | MLT | | | US-MN | | | SCO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age*/US Grade | TC | PL | CC | TC | PL | CC | TC | PL | CC | TC | PL | CC | TC | PL | CC | TC | PL | CC | TC | PL | CC | TC | PL | CC | TC | PL | CC |
| 2+ | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3-4 | | | | | | | | | | | | | | | | | | | | | | | | | | VP | |
| 4-5 Kindergarten | √ | ⊗ | √ | √ | ⊗ | O | √ | VP | √ | | | | | | | | | | | | | √ | | | S | VP | √ |
| 5-6 Grade 1 | √ | ⊗ | √ | √ | ⊗ | O | √ | VP | √ | ⊗ | ⊗ | NA | S | VP | C | ⊗ | ⊗ | ⊗ | √ | ⊗ | O | √ | ⊗ | ⊗ | S | VP | √ |
| 6-7 Grade 2 | √ | ⊗ | √ | √ | ⊗ | O | √ | VP | √ | ⊗ | ⊗ | NA | S | VP | C | ⊗ | ⊗ | ⊗ | √ | ⊗ | O | √ | ⊗ | ⊗ | S | VP | √ |
| 7-8 Grade 3 | √ | VP | √ | √ | ⊗ | O | √ | VP | √ | ⊗ | ⊗ | NA | S | VP | C | ⊗ | ⊗ | ⊗ | √ | ⊗ | O | √ | ⊗ | ⊗ | S | VP | √ |
| 8-9 Grade 4 | √ | VP | √ | √ | ⊗ | O | √ | VP | √ | ⊗ | ⊗ | NA | S | VP | O | ⊗ | ⊗ | ⊗ | √ | ⊗ | O | √ | ⊗ | ⊗ | S | VP | √ |
| 9-10 Grade 5 | √ | VP | √ | √ | ⊗ | O | √ | VP | √ | ⊗ | ⊗ | NA | S | VP | O | ⊗ | ⊗ | ⊗ | √ | ⊗ | O | √ | ⊗ | ⊗ | S | VP | √ |
| 10-11 Grade 6 | | | √ | | | | | | √ | ⊗ | ⊗ | | | VP /G | | | | | √ | | | | | | | | √ |

# Capturing the enacted Curriculum




What did we measure?

What teachers are doing and using in the classroom, along with their classroom context.

| Section number & heading | Section topics covered | Question numbers | Questions (n and % of total) |
|---|---|---|---|
| 1. Introduction | Study information; Consent to participate | 1 | 1 (1.9%) |
| 2. Demographics | Teacher demographics (e.g. age, location); School demographics (e.g. socioeconomic, remoteness) | 2-11 | 10 (18.9%) |
| 3. Current work | Employment; Teaching role; Subject expertise; Experience teaching CS | 12-18 | 7 (13.2%) |
| 4. Qualifications | Qualifications in teaching, computing and other subjects; Participation in classroom research | 19-22 | 4 (7.5%) |
| 5. Student composition | Student cohorts; Classes taught and class size; Demographics of students (reported) | 23-25 | 3 (5.7%) |
| 6. Support and resourcing | Access to infrastructure, facilities and equipment; Available school support (people, PD) and perceived needs; Place of CS classes; Local CS outreach engagement and awareness; CS topics taught and unplugged/plugged; Curriculum document/s used (if any); Access to CS and general teaching materials and technology | 26-38 | 13 (24.5%) |
| 7. Assessment of student learning | Implemented assessment approaches in CS; Reporting required or not | 39-40 | 2 (3.8%) |
| 8. Classroom practice | Learning and teaching strategies (CS specific and general); Programming environments and motivation for use | 41-46 | 6 (11.3%) |
| 9. Self-efficacy and confidence | Teachers' perceptions of their CS capabilities | 47 | 1 (1.9%) |
| 10. Professional development | Participation in types of PD activities; Structure/benefits of PD activities; Perceived PD needs; Extent PD resources used in classroom | 48-52 | 5 (9.4%) |
| 11. Open access data | Consent for anonymous data to be included in open access | 53 | 1 (1.9%) |
| Total | | 1-53 | 53 (100%) |

# 11 Categories

1. Introduction
2. Demographics
3. Current work (position)
4. Qualifications
5. Student Composition
6. Support and Resourcing
7. Assessment of Student Learning
8. Classroom Practice and Motivation
9. Self-Efficacy/Self-Esteem
10. Professional Development
11. Consent for Data

# Sample for Pilot Survey

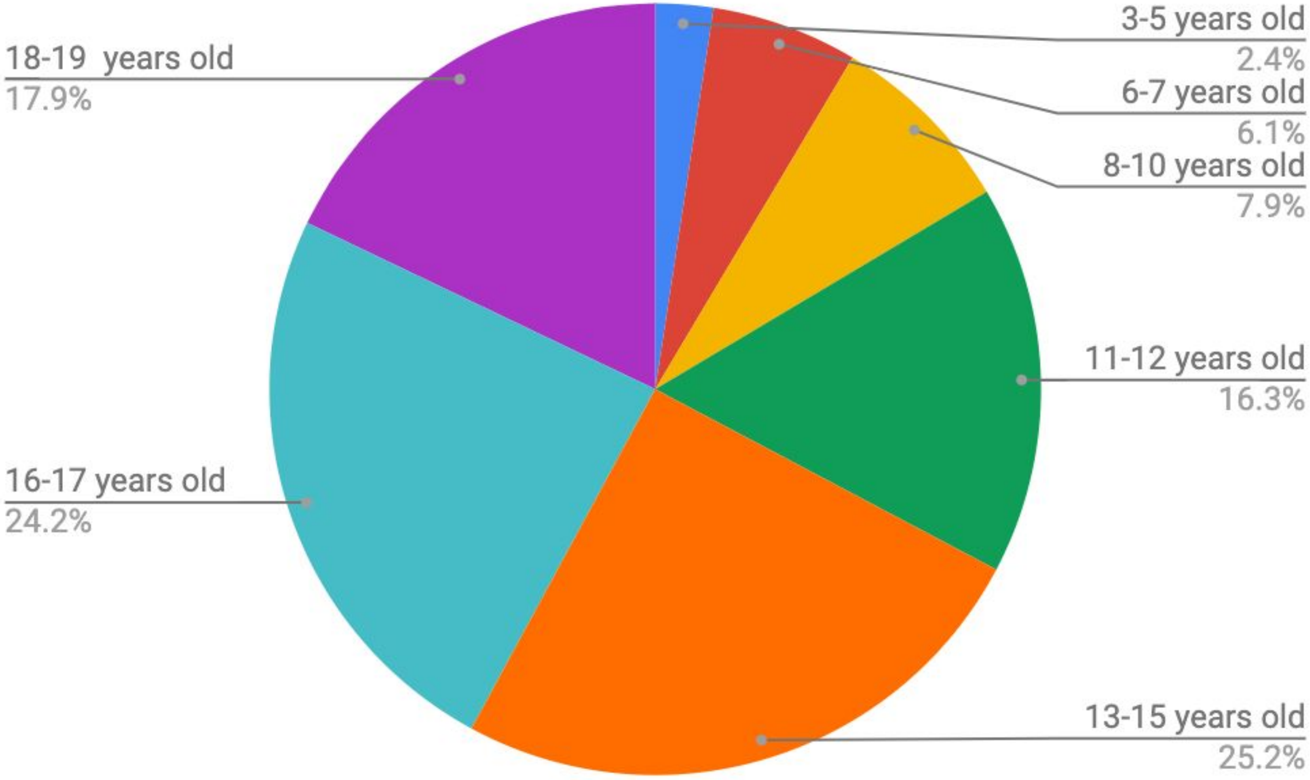
- 700+ responses to the survey
- Full survey on average took 35-40 minutes
- Removed incomplete responses
- Last question asked whether respondent would allow their responses to be in a public dataset
- Remaining - 244 responses

| Country | N | % |
|---|---|---|
| Australia | 14 | 6 |
| England | 52 | 21 |
| Ireland | 19 | 8 |
| Italy | 20 | 8 |
| Malta | 6 | 2 |
| Scotland | 18 | 7 |
| USA | 115 | 47 |
| Total | 244 | 100 |

# Participant sample

- 61% female; 37% male
- 87% ages 30-59
- 49.6% teaching for 12 or more years
- 89% from Government/public schools
- 36% from disadvantaged schools
- 29% rural/remote areas; majority urban/metro
- All were teaching computing in school in some capacity

# Age groups taught



# Findings:
# What is happening in schools?

# Intended curriculum (broad) topics

**Explicit (✓) Implicit (❖) Not covered (✕)**

| Concepts | AUS | US-CO | ENG | IRL | ITA | US-IL | MLT | US-MN | SCO |
|---|---|---|---|---|---|---|---|---|---|
| Computational Thinking | ✓ | ✓ | ✓ | ✓ | ✓ | ✕ | ✓ | ✕ | ✓ |
| Computer Systems | ✓ | ❖ | ✓ | ✓ | ✓ | ✕ | ❖ | ✕ | ✓ |
| Networks and Internet | ✓ | ❖ | ✓ | ✓ | ✓ | ✕ | ✓ | ✕ | ✓ |
| Data & Analysis | ✓ | ✓ | ✓ | ✓ | ✓ | ✕ | ✓ | ✕ | ✓ |
| Algorithms and Programming | ❖ | ❖ | ✓ | ✓ | ✓ | ✕ | ❖ | ✕ | ✓ |
| Impact of Computing | ✓ | ✓ | ✓ | ✓ | ✓ | ✕ | ✓ | ✕ | ✓ |

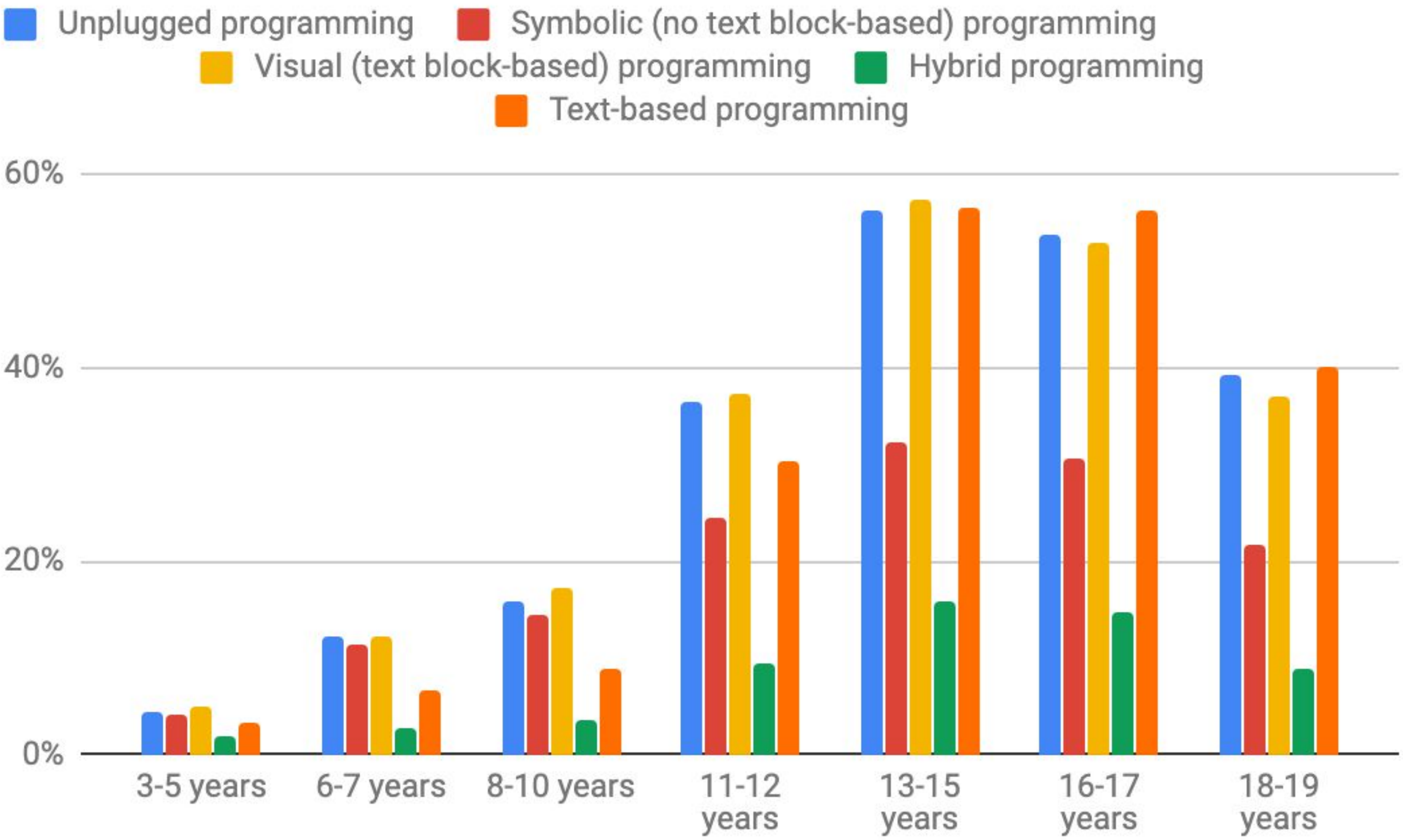
# CS topics taught - Enacted vs Intended

| CS Topics | Australia | England | Ireland | Italy | Malta | Scotland | USA |
|---|---|---|---|---|---|---|---|
| Algorithms | 79%* | 100%* | 68%* | 70%* | 33%* | 100%* | 82%* |
| Artificial Intelligence | 7% | 44% | 32% | 10% | 0% | 6% | 30%* |
| Computational Thinking | 57%* | 96% | 68% | 45%* | 17% | 89%* | 72% |
| Cybersecurity | 71% | 83% | 16% | 35% | 17% | 72%* | 57%* |
| Data analysis and visualisation | 29%* | 44% | 26% | 25% | 0% | 11% | 43%* |
| Data representation (e.g. digital data, binary) | 57%* | 88%* | 53%* | 45%* | 33%* | 100% | 68%* |
| Databases | 14% | 71% | 42% | 45%* | 17%* | 89% | *27% |
| Design process (or Design Thinking) | 86%* | 54%* | 58%* | 20%* | 17% | 56% | 72% |
| Ethics | 29%* | 88%* | 58% | 35% | 0% | 56%* | 75% |
| Hardware | 26%* | 90% | 68%* | 55%* | 50%* | 94%* | 61%* |
| Information Systems | 50%* | 58% | 21% | 30%* | 33% | 72%* | 35% |
| Machine Learning | 7% | 23% | 26% | 5% | 17% | 11% | 21% |
| Networks and Digital Systems | 64%* | 90% | 16% | 40% | 17%* | 39%* | 45%* |
| Privacy | 64%* | 77% | 42% | 40% | 17%* | 61%* | 64%* |
| Programming skills and concepts | 79%* | 100%* | 100%* | 80%* | 50%* | 100%* | 87%* |
| Robotics | 79% | 33% | 42% | 40% | 50%* | 11% | 47% |
| Web Systems | 36% | 62% | 37%* | 50%* | 17% | 94%* | 38% |
| Total sample (n) | 14 | 52 | 19 | 19 | 6 | 18 | 115 |

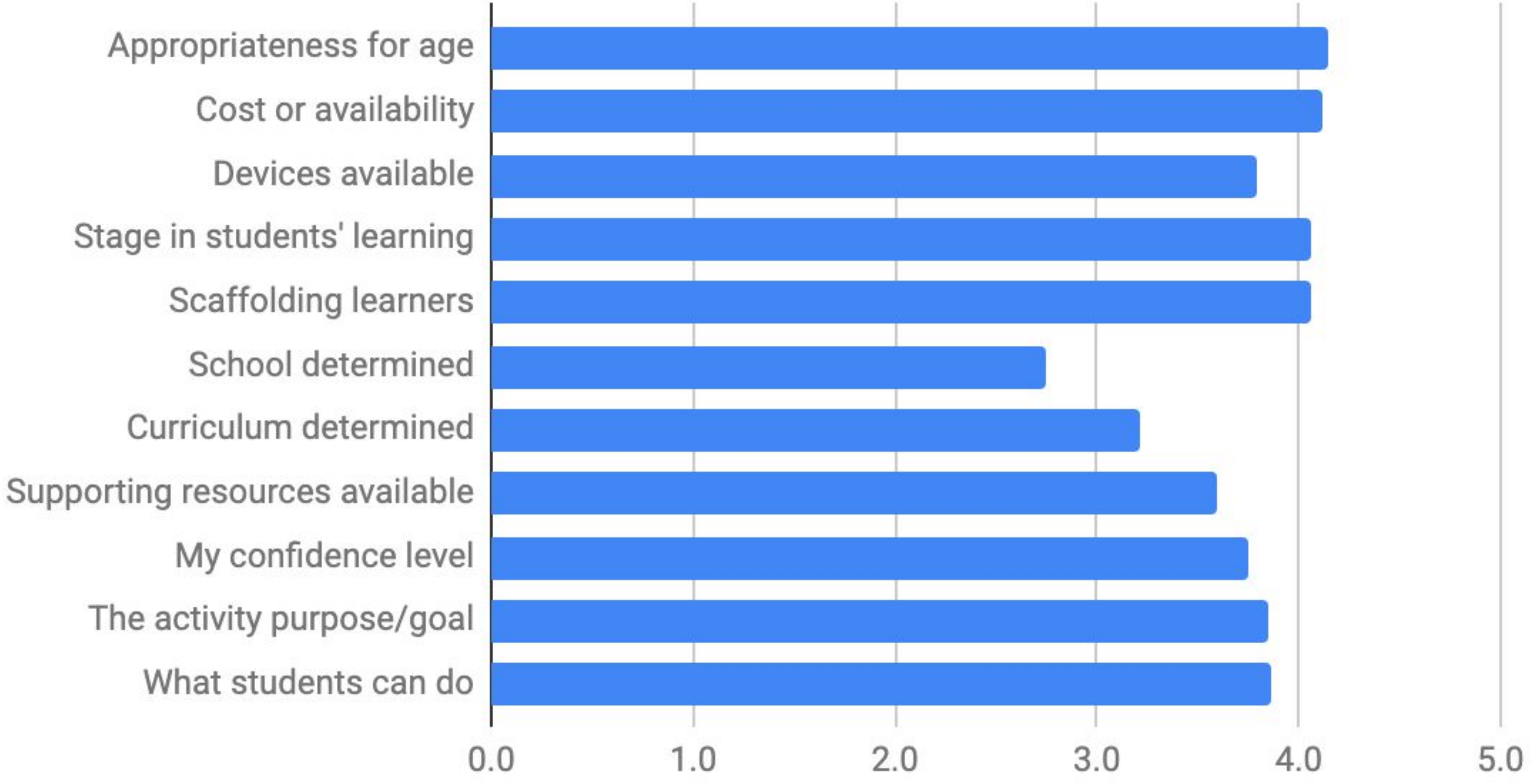
# Programming paradigm used - England

| Ages | Unplugged | Symbolic (no text) | Visual (text) | Hybrid | Text-Based |
|---|---|---|---|---|---|
| 3-5 | 8% | **6%** | **10%** | 4% | 10% |
| 6-7 | 17% | **15%** | **17%** | 6% | 13% |
| 8-10 | 21% | **17%** | **21%** | 6% | **13%** |
| 11-12 | 60% | 40% | 54% | 10% | **58%** |
| 13-15 | 65% | 37% | 58% | 10% | **73%** |
| 16-17 | 63% | 31% | 52% | 8% | **67%** |
| 18-19 | 48% | 21% | 33% | 2% | **48%** |

# Programming Paradigms



# Selection of programming language (all)



# Selection of programming language

| Reason for use | Australia | England | Ireland | Italy | Malta | Scotland | US | All |
|---|---|---|---|---|---|---|---|---|
| Appropriateness for age | 4.1 | 4.2 | 4.1 | 4.2 | 4.0 | 4.1 | 4.2 | 4.1 |
| Cost or availability | 4.1 | 4.1 | 4.1 | 4.1 | 4.2 | 4.1 | 4.1 | 4.1 |
| Devices available | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 |
| Stage in students' learning | 4.1 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.1 | 4.1 |
| Scaffolding learners | 4.1 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.1 | 4.1 |
| School determined | 2.8 | 2.8 | 2.7 | 2.7 | 2.6 | 2.7 | 2.7 | 2.8 |
| Curriculum determined | 3.2 | 3.2 | 3.1 | 3.1 | 3.2 | 3.2 | 3.2 | 3.2 |
| Supporting resources available | 3.6 | 3.6 | 3.5 | 3.6 | 3.6 | 3.5 | 3.6 | 3.6 |
| My confidence level | 3.7 | 3.8 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Purpose of the activity (e.g. robotics) | 3.8 | 3.9 | 3.8 | 3.9 | 3.7 | 3.8 | 3.9 | 3.8 |
| What students can do (tutorial/open) | 3.9 | 3.9 | 3.8 | 3.9 | 3.8 | 3.8 | 3.9 | 3.9 |

# Findings:
# Teacher CS Self-Esteem

## Self-Esteem

Self-esteem is more broadly concerned with a person's positive and negative attitudes or perceptions about their self [38].

It is the emotional response in self-evaluation [23] and belief in themselves to be capable, significant, successful and worthy [12].

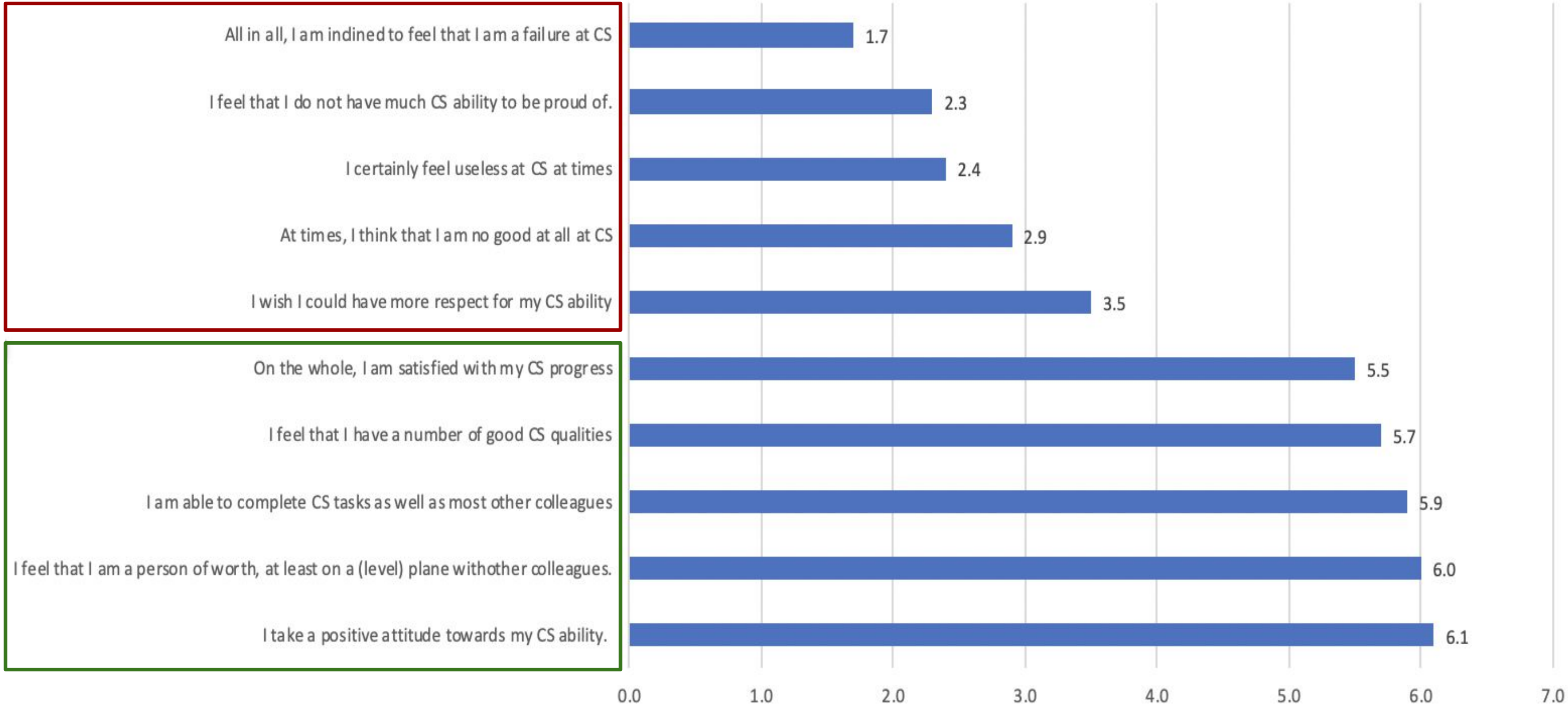
## Self-Efficacy

Self-efficacy is much more task-specific and is concerned with a person's belief in their own capabilities to execute specific tasks [6].

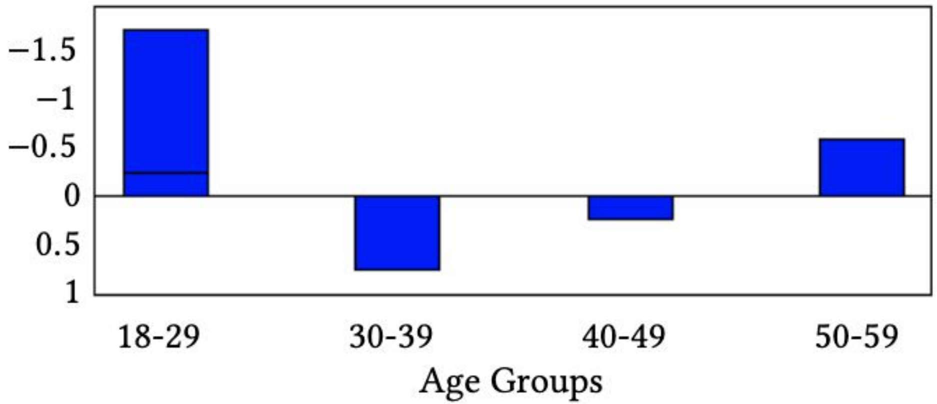
# Self-Esteem & Self-Efficacy

1. **I feel** that I have a number of good qualities (global **self-esteem**)
2. **I feel** that I have a number of good Java programming qualities (domain specific **self-esteem**).
3. <u>**I can**</u> write syntactically correct programming statements(**self-efficacy**).

# Teacher Self-Esteem in CS



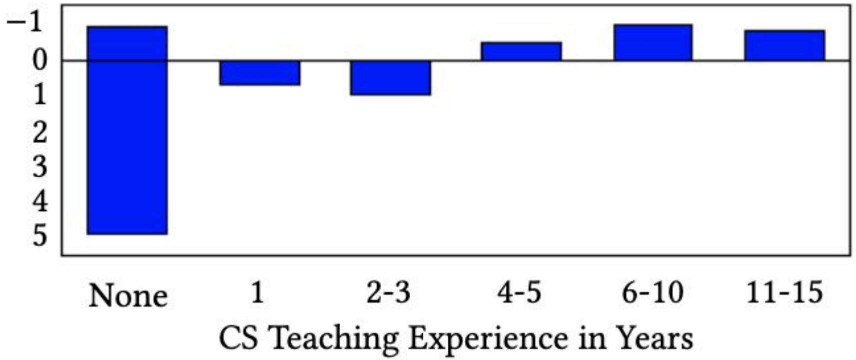
# Teacher Age




NOTE: High CS self-esteem shows as a negative value, while low CS self-esteem is reported as positive.

No significant difference in CS self-esteem according to teacher age groups.

# CS Teaching Experience




NOTE: High CS self-esteem shows as a negative value, while low CS self-esteem is reported as positive.

Statistically significant differences found in teachers' reported CS self-esteem and years of teaching experience.

# Teacher Gender

| Group | CS self-esteem | SD | N |
|---|---|---|---|
| Male | -0.7628 | 3.89 | 82 |
| Female | +0.5036 | 2.98 | 133 |

NOTE: High CS self-esteem shows as a negative value, while low CS self-esteem is reported as positive.

Male teachers reported significantly higher CS self-esteem than female teachers.

# Teaching Age Groups

| Group | CS self-esteem | SD | N |
|---|---|---|---|
| Primary Level | +1.0917 | 4.20 | 56 |
| Second Level | -0.3550 | 3.30 | 163 |

NOTE: High CS self-esteem shows as a negative value, while low CS self-esteem is reported as positive.

Primary teachers reported significantly lower self-esteem than secondary teachers

# Teacher Location

| Country | CS self-esteem | SD |
|---|---|---|
| Australia | +0.3186 | 4.1305 |
| England | -0.4981 | 3.2869 |
| Ireland | +0.9295 | 3.2897 |
| Italy | -0.5448 | 2.4688 |
| Malta | +1.2059 | 2.3013 |
| Scotland | -1.2752 | 3.0671 |
| USA | +0.2954 | 3.9872 |

| Group | CS self-esteem | SD | N |
|---|---|---|---|
| Metro | -0.6028 | 3.36 | 41 |
| Urban | +0.0367 | 3.48 | 106 |
| Rural | +0.2698 | 3.82 | 60 |
| Remote | +1.5121 | 2.59 | 3 |

NOTE: High CS self-esteem shows as a negative value, while low CS self-esteem is reported as positive.

No statistical significant differences identified in reported self-esteem between countries or by region.

# Key findings

- Females, primary teachers and those with no CS teaching experience reported significantly lower CS self-esteem than counterparts.
- Although not significant, teachers further from a city centre and those aged 30-49 reported lower CS self-esteem.
- More Questions!
    - What interventions or PD can improve teacher CS self-esteem and particularly for cohorts with significantly lower CS self-esteem?
    - How long does it take teachers to build CS self-esteem and what impact does low teacher CS self-esteem have on student learning in CS?

# Testing for Reliability & Validity

# Evidence of Reliability

- Instrument was primarily descriptives (discrete) to collect data on classroom practices
    - Two constructs (Motivation and Self-Esteem) had Cronbach alpha values of 0.78 and 0.89, respectively.

- Test-retest reliability not conducted this time, but could be in the future.

# Evidence of Validity

- Validity
  - Construct validity
    - Face validity
    - Concurrent validity
  - Population validity
    - Number of teachers per country
    - Testing for goodness-of-fit for
      - Number of teachers
      - Socio-economic status
      - School location
      - CS teaching experience
  - Sampling validity (sampling of questions to cover our goals)

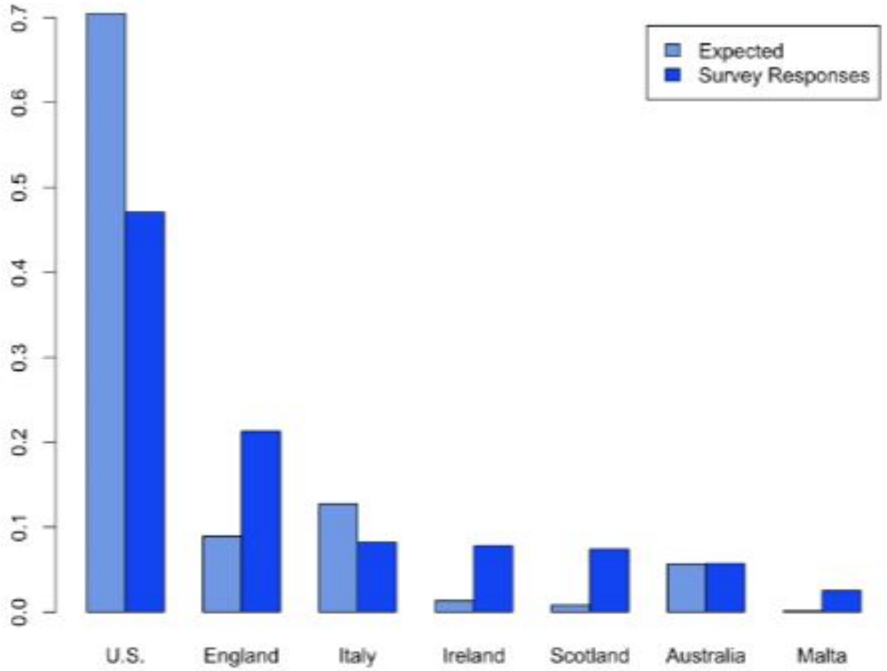
# Face Validity (Internal)

- 10 researchers involved in the construction of the instrument, with a minimum of one per country
- Reviewed each question more than once, with additional discussions of questions
- Pilot survey went through a number of revisions
- After launch and data analyzed, we went through each question again (approx 4 hr process with all researchers) -> METRECC version 1.2

# Construct Validity

- Two constructs (Self-esteem and Motivation)
    - Self-esteem compared to results of a similar scale in another instrument with similar reliability
        - The other instrument was used for undergraduates
        - Months later, we compared the results and found somewhat similar results
    - Motivation scale was unique to the METRECC Survey. Nothing to compare it to, but it did pass internal face validity.

# Population Validity: Country Representation




| Country | # of Teachers | % of Teachers | # in Study | % in Study |
|---|---|---|---|---|
| US | 3,600,000 | 70.52% | 115 | 47.1% |
| England | 453,411 | 8.88% | 52 | 21.3% |
| Italy | 649,495 | 12.72% | 20 | 8.2% |
| Ireland | 66,327 | 1.30% | 19 | 7.8% |
| Scotland | 51,138 | 0.81% | 18 | 1.00% |
| Australia | 288,583 | 5.65% | 14 | 5.7% |
| Malta | 5,923 | 0.12% | 6 | 2.5% |

Goodness-of-fit test using Cramer's V, $\chi2(6, N=196)=385.45$, $p< .0001$, $V=0.51$

# Sampling Validity

Refer you to the paper for the items that were changed and removed for the final survey.

For example, we removed items testing:

- General confidence
- Anxiety
- Motivation (intrinsic and extrinsic)
- Growth Mindset
- Stress in the teaching profession

# Extensions & Future Work

# Limitations and Future Work

- This is a pilot study with a small sample size (n=244).
  - Future work may include administering the survey across more countries and with larger cohorts

- Consider separating and analyzing primary and secondary years due to their differences in topics and programming language requirements

- Further research to monitor changes over time in terms of enacted topics and languages, and teacher motivations.

- Extension of this work in South Asia

csedresearch.org

**Special Content: COVID-19 Related Evaluation Instruments**

Evaluation Instruments    Article Summaries    Conducting Research    RPPforCS

# MEasuring TeacheR Enacted Computing Curriculum (METRECC)

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|---|---|
| **Description** | Designed to measure enacted curriculum across K-12 classrooms internationally. |
| **Target Demographic** | Teachers |
| **Non-Cognitive Constructs** | Social-Contextual - School Climate - Teacher Variables - Self-Esteem<br>Social-Contextual - School Climate - Teacher Variables - Motivation<br>Social-Contextual - School Climate - Other School Variables - Support for teaching CS<br>Social-Contextual - School Climate - Other School Variables - Curriculum/Program |
| **Type** | Computing |
| **Author** | Katrina Falkner, Sue Sentance, Rebecca Vivian, Sarah Barksdale, Leonard Busuttil, Elizabeth Cole, Christine Liebe, Francesco Maiorana, Monica M. McGill, and Keith Quille |
| **Verified** | Author(s) have verified this entry. |
| **Survey** | METRECC_v1.2.pdf<br>METRECC Survey version 1.2.docx |
| **Additional Material** | METRECC_Country_State_K-12CSED_Template.xlsx<br>METRECC_Pilot_Study_Data.xlsx |
| **Year Published** | 2019 |
| **Research Methods** | Quantitative |
| **Number of Questions** | 53 |
| **Type of Questions** | Multiple Choice, Likert style (scale unspecified) |

Available at https://csedresearch.org/tool/?id=185

Or:

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2. Select "Evaluation Instruments"
3. Type METRECC in the search bar.

# METRECC South Asia

Anwar, T., Jimenez, A., Bin Najeeb, A., Upadhyaya, B., & McGill, M. M. (2020, August). Exploring the Enacted Computing Curriculum in K-12 Schools in South Asia: Bangladesh, Nepal, Pakistan, and Sri Lanka. In Proceedings of the 2020 ACM Conference on International Computing Education Research (pp. 79-90).

- Reinterpreted the METRECC instrument as an instrument for collecting information about enacted curriculum in South Asia.

- What we learned:
    - “Gifted” in South Asia means those students with special needs, not top 10%
    - Adding options for curriculum that requires students to write programs by hand (due to limited access to computers for executing them)
    - Restating “computational thinking” which is not commonly used
    - Reframing computer science/programming within ICT, as it is often taught under ICT
    - We added a “bot detection” question
    - Reducing the survey to 10-15 minutes maximum time to take

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# METRECC South Asia

| | |
|---|---|
| **Description** | Measures the enacted curriculum across K-12 classrooms in South Asia (Nepal, Pakistan, Bangladesh, Sri Lanka). Based on the original METRECC survey. |
| **Target Demographic** | Teachers |
| **Non-Cognitive Constructs** | Social-Contextual - School Climate - Teacher Variables - Professional Development<br>Social-Contextual - School Climate - Other School Variables - Support for teaching CS<br>Social-Contextual - School Climate - Other School Variables - Curriculum/Program |
| **Type** | Computing |
| **Author** | Tehreem Anwar, Arturo Jiminez, Arsalan Najeeb, Bishakha Upadhyaya, Monica M. McGill |
| **Verified** | Author(s) have verified this entry. |
| **Survey** | METRECC_South_Asia.pdf<br>METRECC_South_Asia.docx<br>METRECC_South_Asia.qsf |
| **Year Published** | 2020 |
| **Research Methods** | Quantitative |
| **Number of Questions** | 38 |
| **Type of Questions** | Multiple Choice |
| **Cost** | Free |

Note: Evidence of reliability and/or validity have been checked for the specified particular demographic in a particular setting. Using an instrument with evidence of reliability and validity does not mean that the instrument is reliable and valid in your setting. It can provide,

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# Discussion prompts

What are your experiences/observations about enacted CS curriculum in classrooms and how does it compare to what is ‘intended’?

What variables/questions do you think would be interesting or valuable to explore within the METRECC dataset?

# Thank you!

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# Key Takeaways

- Consistent, international instruments and templates can help us capture, compare and track CS education around the world.
- Developing a universal instrument is challenging - with differences in language, curriculum and requirements.
- *Focusing on intended* and *enacted* curriculum allow us to compare what is expected and what is happening in classrooms.
- Early pilot results help us to identify needs and targeted areas for professional development & resource support.
- Having more countries trialing the instruments can help us collectively improve it and grow our understanding of the landscape.