Computing in School in the UK & Ireland: A Comparative Study

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Overview

1. Background
2. Research Questions
3. Policy and provision across the UK and Ireland
4. Teacher survey
5. Findings
6. What's next?

Background

- Increased focus on computing in primary and secondary education in recent years
- Major curriculum and system-level developments, including in UK and Ireland
- Development of the subject requires qualified, confident and well-resourced teachers; significant barriers to face here
- Lots of variation between countries - highlighted by 2021 Brookings Institution report

Research Questions

RQ1: What are the differences in computing education policy and provision across the UK and Ireland?

RQ2: To what extent do these differences impact on computing teachers' experiences?

England

- Since 2014, computing mandatory in all schools from age 5
- Broad subject covering digital literacy + elements of computer science
- National Centre for Computing Education established in 2018 with c. £84m DfE investment
- Elective subject called Computer Science available at GCSE (age 14-16) and A Level (age 16-18)

Population:	56.55m
Schools:	24,413
Students:	8,911,851
Teachers (FTE):	538,312

Image credit: Vecteezy.com

Scotland

- Computing Science mandatory from age 3-15 as part of broad general education (BGE)
- Curriculum updated in 2016
- Optional courses available at Senior Phase (age 15-18) for National and Higher qualifications
- £1.3m Scottish Government investment in 2022 to transform Computing Science in schools

Pop:	5.47m
Schools:	5,099
Students:	796,326
Teachers (FTE):	54,285

Image credit: Vecteezy.com

Wales

- New Curriculum for Wales (starting 2022) making digital competence a statutory cross-curricular skill alongside literacy and numeracy for age 3-16
- New Science & Technology “area of learning and experience” includes computer science
- Optional GCSE and A Level courses in Digital Technology and Computer Science
- Major national initiatives such as Technocamps supporting CS teacher PD

Pop:	3.17m
Schools:	1,470
Students:	470,244
Teachers (FTE):	24,608

Image credit: Vecteezy.com

Northern Ireland

- “Using ICT” is one of 3 statutory cross-curricular skills from early years to age 14 i.e. must be included in lessons
- Using ICT incorporates digital skills
- Optional GCSE and A Level courses in Digital Technology
- GCSE students choose between two Digital Technology routes: Multimedia and Programming

Pop:	1.9m
Schools:	1,134
Students:	344,860
Teachers (FTE):	19,001

Image credit: Vecteezy.com

Ireland

- No mandatory computing in curriculum
- Optional short course in coding at Junior Cycle level (age 12-15)
- Optional Leaving Certificate (age 15-18) Computer Science subject
- Introduction of primary-level computer science curriculum currently under consideration
- Investment in computing teacher PD through National Council for Curriculum and Assessment

Pop:	5.01m
Schools:	3,971
Students:	940,595
Teachers (FTE):	69,343

Image credit: Vecteezy.com

UK and Ireland Computing Teachers Survey (UKICTS)

METRECC instrument

- MEasuring TeacheR Enacted Computing Curriculum (METRECC) instrument
- Developed by a 2019 ITiCSE working group
- Piloted across 7 countries, then reviewed, revised and published
- Several subsequent studies based on METRECC

Adaptation and localisation

- Adapted terminology for UK and Ireland
- Ensured there was a clear rationale for all the data collected
- Included some extra questions on topics of particular interest to the UK and Ireland
- Shortened the survey completion time

UKICTS

- 9 sections; 53 questions
- Survey open for 5 weeks in February-March 2022
- Available in English, Gaelic, Irish (Gaeilge) and Welsh
- Total of 758 raw submissions
- **Final dataset of 512 teachers**

UKICTS participants

Teaching experience:

- 68% teaching for more than 10 years (any subject)
- 32% teaching CS for more than 10 years

Teaching level:

- 72% secondary-only
- 21% primary-only
- 6% cross-phase

Country representation

Country	# of teachers	% of teacher (expected %)	# in study	% in study (observed %)	Observed vs expected %
England	538,312	76.28%	379	74.46%	-1.82%
Ireland	69,343	9.83%	46	9.04%	-0.79%
N. Ireland	19,001	2.69%	17	3.34%	+0.65%
Scotland	53,400	7.57%	42	8.25%	+0.68%
Wales	25,614	3.63%	25	4.91%	+1.28%

Population validity with respect to country: Chi-square goodness-of-fit test determined no significant difference between observed and expected values ($\chi 2 = 3.949$; $df = 4$; $p = .413$)

Topics taught

Survey used same list of topics as international METRECC instrument for future comparisons

Topic	All	SCO	ENG	WAL	IRE	NI
Programming	96.9	100.0	97.4	92.0	93.5	94.1
Algorithms	94.3	95.2	97.4	92.0	80.4	64.7
Cybersecurity	76.2	73.8	81.3	68.0	39.1	76.5
Robotics	29.9	33.3	30.6	28.0	17.4	35.3
AI / ML	34.2	11.9	33.8	44.0	47.8	47.1
Networks & DS	78.7	31.0	88.1	80.0	45.7	70.6
Info Systems	59.0	50.0	62.0	60.0	43.5	58.8
Web Systems	63.3	81.0	62.8	48.0	56.5	70.6
Hardware	82.6	71.4	85.5	84.0	69.6	76.5
Ethics	72.1	47.6	75.5	76.0	65.2	64.7
Data rep	78.5	76.2	79.7	88.0	67.4	70.6
Privacy	68.0	52.4	74.4	60.0	37.0	52.9
Databases	70.3	76.2	72.0	72.0	47.8	70.6
Data analysis	41.8	19.0	44.1	52.0	41.3	35.3
CT (explicitly)	80.5	64.3	83.6	80.0	76.1	58.8
Design	51.4	57.1	48.3	40.0	69.6	64.7

Topics taught by country

High % of teachers report that they teach programming across all countries

In Scotland 100% teach programming but lower numbers report teaching AI, networking and data analysis

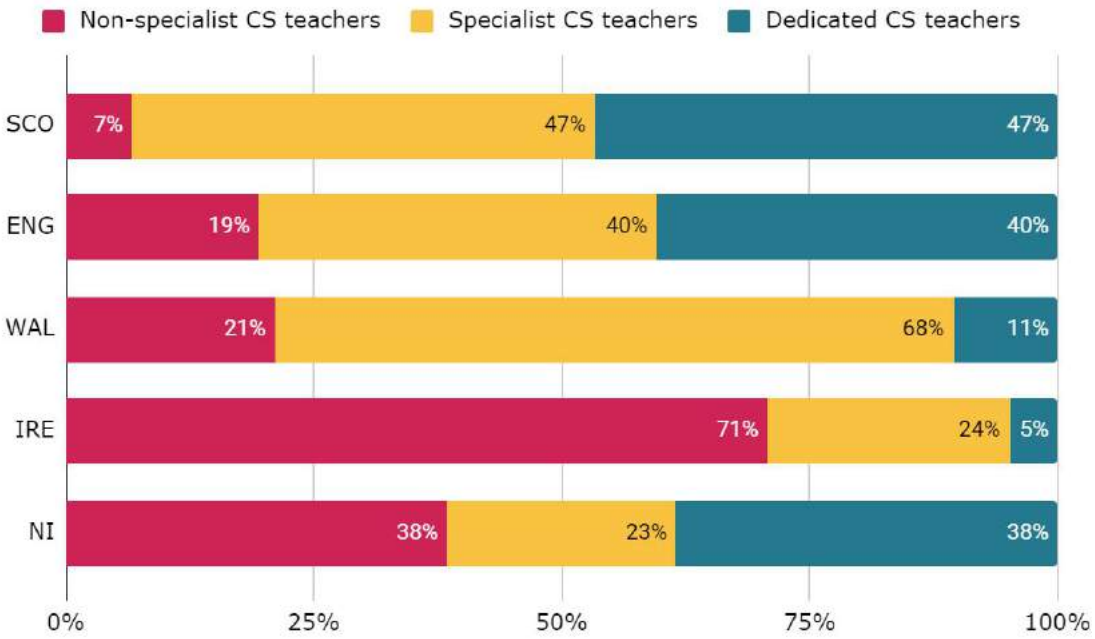
In the Republic of Ireland, lower % teaching cybersecurity, privacy and databases

Teachers are certainly teaching the breadth of computing, which is the goal of most curricula although expressed in different ways

Classroom teaching time

- Some marked differences between countries in amount of classroom time teachers spent on computing
- 93% of teachers in Scotland reported teaching at least 50% of their time on computing - significant difference to Ireland, for example. This aligns to other findings and country policy.

Classroom teaching time: country variation at secondary level



Computing self-esteem

Computer Science Self-Esteem (CSSE) comparison between countries

Country	N	Mean PCA value
Scotland	46	-0.5624
England	379	-0.1675
Wales	25	0.6619
Ireland	46	1.0355
N. Ireland	17	1.8460

- Validated construct for measuring teachers' computing self-esteem
- Responses to 10 statements reduced to one principal component through PCA
- Negative PCA value represents positive CS self-esteem and vice versa
- One-way ANOVA determined a statistically significant difference between country means ($F(5, 469) = 2.42$, $p = 0.0344$)

- Teachers in Scotland and England reported relatively positive CS self-esteem
- Teachers in Wales, Ireland and Northern Ireland reported relatively negative CS self-esteem

Self-esteem reported by teachers is highest where there is either a lot of investment, or a long history of CS

What's next?

- In summary …. our data to date shows experience largely in line with policy and provision, with a few surprises.
- Other responses still to analyse and report on
  - Professional development (take up, experience and barriers)
  - Resources (used and needed)
  - Classroom practice (pedagogy and assessment)
  - Programming languages and tools used
- Changes over time:
  - comparison with 2019 data
  - potential repeat in another 3 years

For discussion:

What are the interesting RQs from your perspective?

Thank you!

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