Computing in School in the UK & Ireland: Comparative Study

UKICER 2022

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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
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
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
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
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
## 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

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

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.

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.

### Topics taught by country

<table>
<thead>
<tr>
<th>Topic</th>
<th>All</th>
<th>SCO</th>
<th>ENG</th>
<th>WAL</th>
<th>IRE</th>
<th>NI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming</td>
<td>96.9</td>
<td>100.0</td>
<td>97.4</td>
<td>92.0</td>
<td>93.5</td>
<td>94.1</td>
</tr>
<tr>
<td>Algorithms</td>
<td>94.3</td>
<td>95.2</td>
<td>97.4</td>
<td>92.0</td>
<td>80.4</td>
<td>64.7</td>
</tr>
<tr>
<td>Cybersecurity</td>
<td>76.2</td>
<td>73.8</td>
<td>81.3</td>
<td>68.0</td>
<td>39.1</td>
<td>76.5</td>
</tr>
<tr>
<td>Robotics</td>
<td>29.9</td>
<td>33.3</td>
<td>30.6</td>
<td>28.0</td>
<td>17.4</td>
<td>35.3</td>
</tr>
<tr>
<td>AI / ML</td>
<td>34.2</td>
<td>11.9</td>
<td>33.8</td>
<td>44.0</td>
<td>47.8</td>
<td>47.1</td>
</tr>
<tr>
<td>Networks &amp; DS</td>
<td>78.7</td>
<td>31.0</td>
<td>88.1</td>
<td>80.0</td>
<td>45.7</td>
<td>70.6</td>
</tr>
<tr>
<td>Info Systems</td>
<td>59.0</td>
<td>50.0</td>
<td>62.0</td>
<td>60.0</td>
<td>43.5</td>
<td>58.8</td>
</tr>
<tr>
<td>Web Systems</td>
<td>63.3</td>
<td>81.0</td>
<td>62.8</td>
<td>48.0</td>
<td>56.5</td>
<td>70.6</td>
</tr>
<tr>
<td>Hardware</td>
<td>82.6</td>
<td>71.4</td>
<td>88.5</td>
<td>84.0</td>
<td>69.6</td>
<td>76.5</td>
</tr>
<tr>
<td>Ethics</td>
<td>72.1</td>
<td>47.6</td>
<td>75.5</td>
<td>76.0</td>
<td>65.2</td>
<td>64.7</td>
</tr>
<tr>
<td>Data rep</td>
<td>78.5</td>
<td>76.2</td>
<td>79.7</td>
<td>88.0</td>
<td>67.4</td>
<td>70.6</td>
</tr>
<tr>
<td>Privacy</td>
<td>68.0</td>
<td>52.4</td>
<td>74.4</td>
<td>60.0</td>
<td>37.0</td>
<td>52.9</td>
</tr>
<tr>
<td>Databases</td>
<td>70.3</td>
<td>76.2</td>
<td>72.0</td>
<td>72.0</td>
<td>47.8</td>
<td>70.6</td>
</tr>
<tr>
<td>Data analysis</td>
<td>41.8</td>
<td>19.0</td>
<td>44.1</td>
<td>52.0</td>
<td>41.3</td>
<td>35.3</td>
</tr>
<tr>
<td>CT (explicitly)</td>
<td>80.5</td>
<td>64.3</td>
<td>83.6</td>
<td>80.0</td>
<td>76.1</td>
<td>58.8</td>
</tr>
<tr>
<td>Design</td>
<td>51.4</td>
<td>57.1</td>
<td>48.3</td>
<td>40.0</td>
<td>69.6</td>
<td>64.7</td>
</tr>
</tbody>
</table>
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.
Computing self-esteem

### Computer Science Self-Esteem (CSSE) comparison between countries

<table>
<thead>
<tr>
<th>Country</th>
<th>N</th>
<th>Mean PCA value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotland</td>
<td>46</td>
<td>-0.5624</td>
</tr>
<tr>
<td>England</td>
<td>379</td>
<td>-0.1675</td>
</tr>
<tr>
<td>Wales</td>
<td>25</td>
<td>0.6619</td>
</tr>
<tr>
<td>Ireland</td>
<td>46</td>
<td>1.0355</td>
</tr>
<tr>
<td>N. Ireland</td>
<td>17</td>
<td>1.8460</td>
</tr>
</tbody>
</table>

- 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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