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

Sue Sentance
ss2600@cam.ac.uk
Raspberry Pi Computing Education Research Centre, University of Cambridge
Cambridge, United Kingdom

Diana Kirby
diana.kirby@raspberrypi.org
Raspberry Pi Computing Education Research Centre, University of Cambridge
Cambridge, United Kingdom

Keith Quille
Keith.Quille@tudublin.ie
Technological University Dublin
Dublin, Ireland

Elizabeth Cole
e.cole.2@research.gla.ac.uk
University of Glasgow
Glasgow, United Kingdom

Tom Crick
thomas.crick@swansea.ac.uk
Swansea University
Swansea, United Kingdom

Nicola Looker
2603392L@student.gla.ac.uk
University of Glasgow
Glasgow, United Kingdom

ABSTRACT

Many countries have increased their focus on computing in primary and secondary education in recent years and the UK and Ireland are no exception. The four nations of the UK have distinct and separate education systems, with England, Scotland, Wales, and Northern Ireland offering different national curricula, qualifications, and teacher education opportunities; this is the same for the Republic of Ireland. This paper describes computing education in these five jurisdictions and reports on the results of a survey conducted with computing teachers. A validated instrument was localised and used for this study, with 512 completed responses received from teachers across all five countries The results demonstrate distinct differences in the experiences of the computing teachers surveyed that align with the policy and provision for computing education in the UK and Ireland. This paper increases our understanding of the differences in computing education provision in schools across the UK and Ireland, and will be relevant to all those working to understand policy around computing education in school.

CCS CONCEPTS

• **Social and professional topics** → *Computing education programs*; **Computer science education**; **K-12 education**.

KEYWORDS

Computing education, teacher professional development, curriculum, METRECC

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1 INTRODUCTION

To develop and establish computing as a school subject we need a qualified, confident and well-resourced teaching workforce [38]; studies have highlighted the barriers teachers and schools face in making this a reality [21, 25, 26, 29]. Research is required into the realities of teaching computing in school across different regions, especially in the context of emerging education policy and practice. A 2021 report by the Brookings Institution comparing computer science (CS) education around the world highlighted seven policy actions that nations should undertake to bring computer science to young people effectively [35]. Three of these related to the development of curricula and programmes to teach ICT and CS; two to the provision of in-service and pre-service teacher education; one to the provision of a specialised centre focused on CS education research and training; and finally, one related to the need for sustained government funding. It is thus clear that we need to find out more about the impact of regional policy on the teaching of computing[1]. One of the ways we can do this is by regularly surveying computing teachers to ascertain their views and experiences, and by comparing and contrasting different jurisdictions' approaches to computing in school. The study reported in this paper set out to investigate the following 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?

We have combined an analysis of policy and curricula relating to the teaching of computing with a survey of teachers. In the next section we highlight the differences between the policy context, curriculum, and teacher preparation in the UK (England, Northern Ireland, Scotland and Wales) and the Republic of Ireland[2].

2 COMPUTING IN THE UK & IRELAND

Policy differences relating to school computing education provision will obviously impact on teachers' and students' experience. In this section we address RQ1: *"What are the differences in computing education policy and provision across the UK and Ireland?"* by reviewing the current status of computing education of England,

[1] Computing is a generic term we use throughout to include computer science (CS), computing science, and other CS-related subjects in the various jurisdictions

[2] Throughout this paper we use the following abbreviations in tables and figures: ENG = England; IRE = Ireland; NI = Northern Ireland; SCO = Scotland; WAL= Wales.

Scotland, Wales, Northern Ireland, and the Republic of Ireland, and highlighting the national-level policy, curriculum and provision for teacher education. The five countries investigated in this study vary greatly in size, with populations ranging from 56.55m (England) to 1.9m (Northern Ireland), and similar differences in their respective education systems. Table 1 shows the breakdown of overall population and numbers of schools, students and teachers by country. With education in the UK being devolved to individual national parliaments and legislatures, the development of computing as a school subject is at different stages across the study countries due to many factors. The current context of computing education in each country is described below. Table 2 provides a snapshot of which computing concepts are covered in each country's curriculum.

Table 1: Country-level demographics (2022)

Country	ENG	IRE	NI	SCO	WAL
Pop. (m)	56.55	5.01	1.90	5.47	3.17
Schools	24,413	3,971	1,134	5,099	1,470
Students	8,911,851	940,595	344,860	796,326	470,244
Teachers (FTE)	538,312	69,343	19,001	54,285	24,608

Table 2: Concepts included in national-level curricula

Concepts	ENG		IRE		NI		SCO		WAL	
	P	S	P	S	P	S	P	S	P	S
Computational Thinking	E	E	N	E	I	I	E	E	E	E
Computer Systems	E	E	N	E	I	I	E	E	E	E
Networks and Internet	E	E	N	E	I	I	E	E	E	E
Data and Analysis	E	E	N	E	I	I	E	E	E	E
Algorithms and Programming	E	E	N	E	I	I	E	E	E	E
Impact of Computing	E	E	N	E	I	I	E	E	E	E

P = Primary; S = Secondary; E = explicit; I = implicit; N = not covered / no curriculum

England. In September 2014, changes to England's national curriculum for computing were implemented [14], including the removal of the subject formerly known as *Information and Communication Technology* (ICT) which was replaced by the subject *Computing* [3, 4, 12]. Computing has three elements: *Information Technology*, *Digital Literacy* and *Computer Science* [33]. The major new elements of the subject for teachers are in the computer science area which is where thousands of teachers have had to develop new subject knowledge, alongside new teaching strategies, assessment support and, above all, confidence. The curriculum is now in its seventh year; in November 2018, the Department for Education invested c.£84 million in the *National Centre for Computing Education*, for a four-year programme of development of teacher training and student resources in computing. This represented one of the most substantial moves towards educating all children in the discipline of computing in the world. England was the only country studied by the Brookings Institution to have implemented all the seven policy actions identified [35]. Both pre-service and in-service teacher education in computing education is available, although pre-service training for primary non-specialist teachers is limited.

Scotland. All pupils have an entitlement from pre-school (age 3) up to the third year of secondary school (age 15) to a Broad General Education (BGE) covering eight curriculum areas including technologies (CITE). The technologies subject area includes the study of computing science through experiences and outcomes ("Es" and "Os") that provide clear and concise statements about children's learning and progression. Scotland's national improvement agency, Education Scotland, in collaboration with teachers and universities, updated the CS curriculum in 2016. All CS Es and Os across the BGE are organised into three interrelated strands: *Understanding the world through computational thinking*; *Understanding and analysing computing technology*; and *Designing, building and testing computing solutions*. Schools and Early Learning and Childcare settings have ownership of how CS is organised and delivered within the overarching standards. In the 4th-6th year of secondary school the Scottish Qualification Authority's (SQA) National Qualifications (NQ) in Computing Science are available as an optional choice within many schools. In 2022, the Scottish Government invested £1.3 million to transform Computing Science in schools and establish the Scottish Teachers Advancing Computing Science organisation, which works with schools to spread best practice.

Wales. Since 2015, Wales has been developing a new purpose-led, co-constructed, bilingual national curriculum for learners aged 3-16, in line with international trends towards school autonomy in determining curricular content, child-centred pedagogy and a focus on so-called "21st century" skills, with four overarching purposes providing the context and aspiration for learners [9, 20]. The new Curriculum for Wales [37], starting from September 2022, reinforces the societal importance of digital competence as a statutory cross-curricular skill alongside literacy and numeracy, for all learners aged 3-16. The development of a bilingual cross-curricular *Digital Competence Framework* for all learners moved away from a previously narrow focus on developing "IT user skills" [1, 11] into a broader purview that includes digital rights and citizenship, interacting and collaborating, media literacy, computational thinking and data skills. These reforms also present significant changes to the discipline of CS [1, 10], as part of a new interdisciplinary *Science & Technology* "area of learning and experience", bringing together the subjects of biology, chemistry, computer science, design & technology/engineering, and physics [8]. Alongside these major (and ongoing) curriculum and system-level reforms in Wales, there have also been significant policy attention and interventions to address issues with CS/STEM teacher recruitment, retention and professional learning, including major national initiatives such as the Technocamps project to improve teacher confidence and capability to deliver the new CS curriculum [21].

Northern Ireland. Digital skills are included from primary through to upper secondary as part of *Using ICT* (UICT), which is one of three statutory Cross-Curricular Skills that form part of the Northern Ireland Curriculum; the other two are Mathematics and Communication. The intention of UICT is to "provide pupils with opportunities to acquire, develop, understand, demonstrate and apply ICT concepts and processes appropriately in a variety of contexts" [5]. At the age of 14, students are able to choose to take a GCSE-level qualification (Level 2) in a number of subjects, including Digital Technology, which replaced ICT in 2017, or Computing. Digital Technology is increasing in popularity and students can choose to take one of two routes: *Multimedia* or *Programming*.

Republic of Ireland. In 2016, Ireland introduced its first optional computing course – called *Coding* – for lower second-level students (known as the Junior Cycle) [22]. In 2017, the first statement of intent from the Irish government for an upper second-level (Leaving Certificate) subject was published [23], where the proposed subject was called Computer Science. This was followed by an expedited curriculum development, where by September 2018, the National Council for Curriculum and Assessment (NCCA) had established a steering group, published a draft specification for external consultation, finalised the specification [23], identified 40 phase one schools (pilot schools) and developed a series of Continuing Professional Development (CPD) programmes to support the phase one teachers through the Professional Development Service for Teachers (PDST). 40 phase one schools began their Leaving Certificate programme in 2018, where the capstone is a state examination and coursework. The Leaving Certificate Computer Science subject consists of three strands: *Practices and principles*, *Core concepts* and *Computer science in practice* (containing four applied learning tasks [23, 24]). This course is now being delivered by approximately 150 out of a total of 730 second-level schools in Ireland.

3 TEACHER SURVEY

3.1 Methodology

For the survey, we used the ***ME**asuring **T**eache**R** **E**nacted **C**omputing **C**urriculum* (METRECC) instrument [16], which was designed to capture many aspects of enacted curriculum and teacher experience across multiple countries. The study involved three key stages: (i) Instrument selection and localisation; (ii) Participant recruitment and data collection; and (iii) Data processing and analysis.

3.2 The METRECC instrument

The METRECC instrument was developed by a 2019 ITiCSE Working Group [16]. The development process involved the design and curation of suitable questions and constructs, a pilot study consisting of 244 teachers across seven countries (Australia, England, Ireland, Italy, Malta, Scotland and the USA) and a review (including validity and reliability tests) leading to revisions and the final published survey instrument. The METRECC study openly published the data to allow for replication or re-validation studies. The work from this international group continued with several follow-up studies, including an international comparison of K-12 CS intended and enacted curricula [17], a pilot study of K-12 teachers' CS self-esteem [36] and a study comparing programming self-esteem of upper secondary school teachers to CS1 students [15].

3.3 Localising METRECC

The METRECC instrument was designed to have broad international scope, which meant it included questions and terminology that lacked relevance for the UK and Ireland context, and excluded some questions that were of particular interest in this context. The original pilot survey was also lengthy, with a high proportion (65%) of incomplete responses. We therefore conducted a process of adaptation of the instrument to (i) ensure terminology was meaningful to teachers in the UK and Ireland, (ii) articulate a clear rationale for all the data collected and ensure topics of particular interest to the UK and Ireland were included, and (iii) shorten the survey completion time in order to encourage teacher participation. The key changes made to the original survey were:

- Changes to terminology related to school types, year groups, subject areas, qualifications, and school locations;
- Addition of questions on participants' educator status and ethnicity, use of computing to support fluency in official national languages, specific programming languages/tools used, and engagement with national PD initiatives;
- Simplification of lengthy matrix questions, such as those on assessment practices, teaching approaches, programming languages/tools, and PD activity characteristics;
- Removal of questions lacking relevance or a strong rationale for collecting the data.

The final survey comprised 53 questions; 16 were branched based on the participant's country, and 4 others were displayed only if relevant based on the previous answer. In total each study participant was asked between 36 and 41 questions, taking an average of 14 minutes to complete. The survey was translated into Scottish Gaelic, Irish (Gaeilge) and Welsh, and teachers could select their preferred language. Of the 53 questions in the survey only 25 questions have been analysed for this paper; further papers will report on other results.

3.4 Data collection

The survey was open for five weeks from 7 February 2022 to 14 March 2022. Purposive sampling was used to identify computing teachers, with each of the paper authors disseminating the survey in their respective countries. Methods used included mailing lists, newsletters, blog posts, promotion through school and teacher networks and individual messaging. A choice was made to avoid relying on social media, in order not to limit the pool of teachers reached. Snowball sampling was also used, with participants encouraged to share the survey with other computing teachers.

The original METRECC instrument also included a country report template to capture core information about the demographics of each study country and their CS policy and intended curriculum. Each of the paper authors completed this template for their country, drawing on publicly-available data and their own expertise. The dataset, country information and survey questions have been made publicly available [32].

3.5 Data analysis

In total, 758 people participated in the survey. Of these, 19 were disqualified at the start of the survey because they were under 18 years of age (n=9), were not a teacher/educator (n=9) or did not consent to take part (n=1). Of the remaining responses, 226 (31%) were incomplete and were removed from the data set during preprocessing, as was one response from a country outside the scope of the study. The final dataset consisted of 512 participants.

Only six responses were submitted in languages other than English: three each in Scottish Gaelic and Welsh, of which one in each language was complete. No responses were received in Irish. Initial data analysis was conducted using Python scripts, followed by investigation of the data in Excel and analysis in SPSS. Analysis of the survey data in this paper focuses on a subsection of the results.

3.6 Population sample

We examined the population validity of our study sample with respect to country, by comparing the number of study participants from each country in our final data set with the expected number based on those countries' respective teacher populations. Table 3 shows that the observed percentage of study participants per country maps closely to expected percentages based on overall teacher population, indicating that our sample is representative of the wider population in this respect. We also ran a chi-square goodness-of-fit test which confirmed that there is no significant difference between the observed and the expected values ($\chi^2 = 3.949; df = 4; p = .413$).

Table 3: Country representation

Country	# of teachers	% of teachers (expected %)	# in study	% in study (observed %)	Observed vs expected %
ENG	538,312	76.28%	379	74.46%	-1.82%
IRE	69,343	9.83%	46	9.04%	-0.79%
NI	19,001	2.69%	17	3.34%	+0.65%
SCO	53,400	7.57%	42	8.25%	+0.68%
WAL	25,614	3.63%	25	4.91%	+1.28%

4 SURVEY FINDINGS

We report on teachers' experience of computing in the five countries by examining a subsection of the results from the complete survey: teacher characteristics, qualifications, feeling qualified, self-esteem, time teaching computing, and computing topics taught.

4.1 Teacher characteristics

55% of participating teachers described themselves as female and 44% male. In terms of age, 33% of teachers across all countries were aged 50 and over, 37% were between 40 and 49, 24% between 30 and 39 and only 6% were between the ages of 18 and 29. 91% described themselves as White, 4% as Asian/Asian British, and 2% as Black/African/Caribbean/Black British, with the remaining 3% of teachers describing their ethnicity as Other or Multiple Ethnic Groups, or not providing ethnicity information.

Respondents to the survey included many more secondary teachers than primary teachers, with 72% classed as secondary-only and 20% as primary-only. Wales had the lowest number of primary-only teachers, with only one in the final data set, and the highest number of cross-phase teachers (20%).

Teachers completing the survey were on the whole experienced, both in general and in their teaching of computing. More than 65% had more than 10 years' experience of teaching in any subject, and over 30% said they had more than 10 years' experience teaching computing. This percentage was highest in Scotland, where the subject has always been available and did not experience a shift to ICT in the 1990s as it did in Wales, Northern Ireland and England.

4.2 Qualifications held by teachers

Teachers were asked what qualifications/certifications they held in computing or a related discipline. Overall, the most commonly held qualification was a Bachelor's degree (or equivalent) in computing (37% of participants), followed by computing professional development (PD) (29%). 23% of study participants held no qualifications in computing or a related discipline. This was most common among those from England (26%) and least common for Northern Ireland (only 6%). In total, 49% of primary-only teachers held no computing qualifications, compared to 16% of secondary-only and 31% of cross-phase teachers. Among those with computing qualifications, there was considerable variation between countries. More than half of participants in Scotland held a Bachelor's degree in CS, compared to 28% of those in the Republic of Ireland. A much higher percentage of those in Ireland and Northern Ireland reported holding a Diploma/Certificate in CS than in other countries. 39% of those in Ireland and 31% in England had CS PD, compared to only 7% of those in Scotland.

4.3 Feeling qualified

Teachers were also asked to respond to the statement "*I feel qualified to teach CS*" on a scale from 1 (strongly disagree) to 5 (strongly agree). On the whole, study participants felt qualified: 76% either agreed or strongly agreed, while 10% disagreed or strongly disagreed. We saw some variation by teaching level and country. The proportion at each teaching level who either agreed or strongly agreed was similar, but fewer primary-only teachers selected the 'strongly agree' option (35% vs 51% of secondary-only teachers). Across the study countries, teachers in Scotland were most confident, with 91% either agreeing or strongly agreeing with the statement, while teachers in Ireland were least confident, with 59% agreeing or strongly agreeing.

4.4 Qualifications and feeling qualified

In order to explore whether there was any link between qualifications held and teachers' feeling of being qualified, we categorised qualifications into four levels, from 'none' to a degree in CS, and grouped teachers based on their highest level of qualification[3]. Figure 1 shows how teachers' response to the statement "*I feel qualified to teach CS*" varied based on the highest level of qualification they held. Those with CS PD, a post-16 CS qualification or a Diploma/Certificate in CS responded similarly to those with no CS qualifications. The only qualification level which appears to have an impact on teachers' feeling of being qualified is an undergraduate degree or above: 88% of these teachers agreed or strongly agreed that they felt qualified and only 7% disagreed or strongly disagreed.

While we could not find a direct relationship between qualifications and the feeling of being qualified, over 90% of Scottish teachers reported that they felt qualified to teach CS, compared to 65% of the teachers from the Republic of Ireland.

4.5 Teachers' self-esteem

The METRECC instrument included a validated construct for measuring teacher CS self-esteem [16, 36], which was adapted from the Bergin Programming Self-Esteem Instrument [2]. This construct was included, unchanged, in this study. Teachers responded to 10 statements on a seven-point Likert scale, from 1 (strongly disagree) to 7 (strongly agree). Principal Component Analysis (PCA) was used to reduce the 10 items to one principal component, thus obtaining a single value to accurately represent a teacher's CS self-esteem [36]. The resultant PCA values represent comparative CS self-esteem, where a negative PCA value represents positive CS self-esteem and

[3] 37 study participants who only answered "Other" regarding qualifications held were excluded from this analysis.

a positive PCA value represents negative CS self-esteem. Table 4 shows the average PCA values per country.To test the internal consistency of the CS self-esteem construct, Cronbach's α (alpha) was used. For this study, we measured Cronbach's α to be 0.78, which is regarded as reliable [6].

Table 4: Computer Science Self-Esteem (CSSE) comparison between countries (ordered from highest CSSE to lowest)

Country	N	Mean PCA value	Standard deviation
SCO	46	-0.5624	3.5951
ENG	379	-0.1675	3.4741
WAL	25	0.6619	4.1117
IRE	46	1.0355	3.6720
NI	17	1.8460	4.7313

There was a statistically significant difference between country means as determined by one-way ANOVA ($F(5, 469) = 2.42, p = 0.0344$) (see Table 4), although it should be noted that some countries had relatively small sample sizes. Of the study countries, teachers in Scotland reported the highest CS self-esteem, followed by England. Teachers in these two countries also reported positive CS self-esteem, whereas those in Wales, the Republic of Ireland and Northern Ireland reported relatively negative CS self-esteem.

4.6 Time spent teaching computing

Teachers were asked how much of their classroom time per week they spend teaching CS. To simplify the responses we then grouped participants into three categories: non-specialist CS teachers (<50% of classroom time spent on CS), specialist CS teachers (50-100% spent on CS) and dedicated CS teachers (100% spent teaching CS). Overall, study participants were split quite evenly between the three categories, with 34% non-specialist teachers, 35% specialist teachers and 31% dedicated teachers. As expected, far more primary teachers were non-specialist CS teachers: 70% of primary-only teachers vs 25% of secondary-only and 28% of cross-phase teachers.

In terms of variation between countries, one third of primary-only teachers in England and Ireland were classified as specialist or dedicated CS teachers, compared to only 10% in Scotland and none in Wales and Northern Ireland. The proportion of dedicated CS teachers was much lower in Wales and Ireland. For secondary teachers, we noted that in Scotland only 7% of secondary-only teachers were non-specialists, compared to 71% in Ireland and 38% in Northern Ireland, 19% in England and 21% in Wales. Even with the small samples sizes the difference between the amount of classroom teaching time focused on computing in Scotland and the Republic of Ireland is marked.

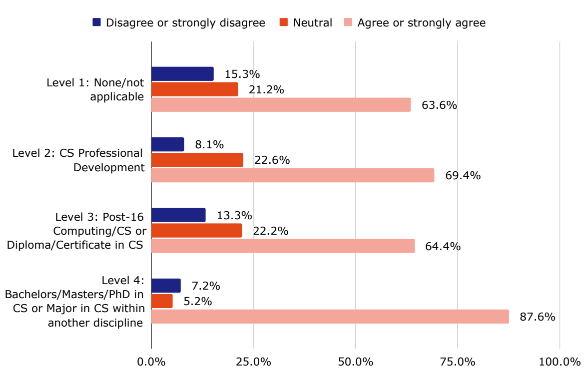

Figure 1: Response to statement "*I feel qualified to teach CS*", by highest CS qualification held

4.7 Computing topics taught

One of the original intentions of the METRECC instrument was to examine the differences between the intended curriculum and the enacted curriculum [17]. Teachers indicated which computing topics they teach. The responses were analysed by teaching phase (primary, secondary or cross-phase) and by country. Table 5 shows the differences by country. Notable differences included:

- There were differences between primary and secondary teachers across all countries. More primary and cross-phase teachers reported teaching robotics. More secondary teachers reported teaching topics such as ethics, data representation, artificial intelligence and machine learning (AI/ML), and hardware.
- Teachers in Wales taught less about web systems and design than other countries
- In England, more teachers than average report that they teach every computing topic except web design and AI/ML.
- All respondents in Scotland reported teaching programming and they also had the highest proportion teaching databases and web systems.
- The Republic of Ireland had the lowest proportion of respondents reporting that they taught cybersecurity, robotics, information systems, hardware, data representation, privacy and databases, but the highest proportion saying they taught AI/ML and design.
- Of the relatively small sample of Northern Irish teachers there was a noticeable difference in those that claimed they taught algorithms (65% compared to 94% overall) and computational thinking (59% compared to 81% overall).

5 DISCUSSION

Including computing in the school curriculum has led to concerns about how teachers will manage this change [27, 30, 31, 34]. Teachers may have a need for new subject knowledge in computer science [21, 38], may need to gain confidence in their abilities to develop and teach the new subject [13, 19, 34], and may feel isolated or lack identity [18, 30, 34].

In this section we report on the findings with respect to our second research question: *To what extent do these differences impact on computing teachers' experiences?*. We can analyse this by trying to answer three questions:

- Does policy impact teachers' qualifications/PD and the extent to which they 'feel qualified'?
- Is the 'intended' curriculum being taught in schools?
- How much computing is actually being taught in schools?

Table 5: Topics taught by country (% teachers)

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

5.1 Differences in teachers' qualifications and training

The teachers participating in our survey had to a large extent been teaching for many years (see Section 4.1) and, in contrast, the changes in the computing curriculum had happened more recently in all countries except Scotland (see Section 2). Of the five countries under examination, England has had significant investment of government funding into the training of teachers [28]. The Republic of Ireland also has a funded PD programme (through the NCCA) specifically for computing teachers delivering the subject. Perhaps unsurprisingly then, more English and Irish teachers reported that they had undertaken PD in CS. In terms of the qualifications already held by teachers, Scotland has the highest number of teachers who have a Bachelor's degree or above in CS. This reflects the longstanding requirement in Scotland to have a degree with a substantial CS component. As reported in Section 4.2, 90% of Scottish teachers reported that they felt qualified to teach CS, compared to 65% of the teachers from the Republic of Ireland. This suggests that the requirement for a degree may be more relevant to teacher confidence than PD but this obviously needs further exploration.

The other measure we used to examine teachers' feelings about teaching computing was the self-esteem construct. Again we see that teachers in Scotland reported the highest CS self-esteem, which was positive in contrast to Wales, the Republic of Ireland and Northern Ireland. England is the country that has had the most substantial policy actions with regards to computing [35], including the establishment of a national centre for computing education, the provision of training for both pre-service and in-service teachers, and a mandatory computing curriculum for all children aged 5-16. While teachers in England reported positive self-esteem, it was not as high as teachers from Scotland, and they were less likely to say they felt qualified to teach computing (78% compared to 91%).

5.2 The intended vs enacted curriculum

We can compare Table 2 with the topics that study participants reported covering in their CS teaching (see Section 4.7). This was explored by Falkner et al. [17] as part of the original METRECC study to examine whether the intended curriculum matched the enacted curriculum. We largely noted alignment between the national curricula in the UK and Ireland and the topics teachers teach. Nearly all teachers said that they taught programming, which is included in all curricula, either implicitly or explicitly, except the Irish primary curriculum. In the Scottish secondary curriculum, networking is not explicitly covered, which aligns with the fact that only 31% of Scottish CS teachers said that they covered it. In the curriculum in Northern Ireland, all topic areas are implicitly rather than explicitly covered, but the average topic coverage of Northern Irish respondents was higher than some other countries' responses. A surprisingly high percentage of Northern Irish teachers were teaching AI and machine learning (47%) and robotics (35%), which would suggest further exploration is needed in case of sample bias.

5.3 Computing being taught in schools

The differences noted with regard to the amount of time teachers spend teaching computing may not directly follow on from education policy. For example, the fact that England has a mandatory computing curriculum for children aged 5-16 does not ensure that children have access to a specific number of hours of computing each week [7], or that they should be taught by teachers who teach computing for the majority of their teaching time. In secondary schools the most notable finding was that 93% of teachers in Scotland teaching computing science were teaching computing for more than 50% of their time, suggesting the existence of a specialised, as well as well qualified (see Section 4.2) workforce. In contrast a much smaller proportion of secondary teachers from the Republic of Ireland were predominately teaching computing, with other countries falling between these two extremes. It is to be expected that primary teachers would teach many subjects as well as computing, so it is surprising that in England, 33% of primary teachers completing the survey taught computing for at least 50% of their timetable. This suggests that primary schools in England are recruiting computing specialists who teach computing across multiple years. This doesn't seem to happen in other countries. The conclusion that may be drawn from these findings is that, with the exception of Scotland, schools may not be delivering as many hours of computing as might be expected from the computing education policy in the country. This would be worthy of further investigation.

6 CONCLUSION

In this paper we presented the results of a study into the teaching of computing across the four nations of UK and the Republic of Ireland. With 512 complete responses across the five countries, the analysis of the collected data, together with the education policy with respect to CS in each country, provides a good opportunity to identify and report on the similarities and differences of these countries' computing provision in school. In this short paper, we have sought to highlight key policy differences and their impact on teachers; it is intended to explore other areas of computing teachers' experience as part of future research.

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