



Computing Science Teachers in Scotland 2016

A report by

COMPUTING AT SCHOOL SCOTLAND
EDUCATE • ENGAGE • ENCOURAGE



Key Findings

- The number of Computing teachers in Scotland is down to 598 in 2015. This is the lowest number of any specialist teacher considered to be within either the Sciences, Technologies or Mathematics curricular areas.
- The number of Computing Science teachers has gone down by 25% over the last ten years, disproportionately in comparison to the number of pupils (11%) and the numbers of English, Maths and Physics teachers (4%, 6% and 10% respectively).
- Nationally we now have 17% of schools with no computing specialist. That is 62 secondary schools without a subject specialist to deliver the experiences and outcomes for the subject or to deliver certificate-level courses.
- There are now 17 local authorities with secondary schools without CS teachers, up from 12 in 2014. This represents over half of all local authorities.
- A quarter of Secondary schools have only one CS teacher. Schools with a single CS teacher are vulnerable to losing that teacher.
- Almost half (47%) of local authorities reported difficulties recruiting suitable candidates for CS teacher vacancies. Even where a post was filled, there have been many instances where only one or two suitable candidates applied.
- 56% of local authorities have had difficulties in getting Computing supply cover.
- New teachers entering the profession is down 67% on 2006
- Initial Teacher Education Institutions are struggling to recruit enough high quality applicants. Only three of the eight PGDE students studying Computing education at the University of Glasgow last year completed the course, and only two of them went into the Scottish Teacher Induction scheme.
- Only 20 newly qualified teachers have joined the teachers' induction scheme in 2016, the same number as in 2014.
- There are 2698 teachers registered with the GTCS with Computing as their main or additional subject yet only 598 are actively teaching the subject.

Background

Computing At School Scotland conducted Freedom of Information requests in 2012, 2014 and in 2016 regarding the workforce of secondary Computing Science teachers across Scotland.

In 2012 we requested information from all 32 local authorities on the number of Computing teachers in each school in their authority currently and the same figures from 2006 (as we knew this to be the peak year of CS teachers based on Scottish Office data). In June 2014 and June 2016 we repeated the FOI requests to see how the picture had changed. We felt that it would be useful to investigate the numbers of new teachers coming into the system so we also asked the GTCS about the numbers of probationers and new teachers in Computing in Scotland.

Data sources

We made Freedom of Information requests with the following organisations:

- All 32 local authorities (30 satisfactory responses, one did not breakdown the figures by school and one is thought to be inaccurate)
- The Scottish Qualifications Authority (SQA)
- The General Teaching Council for Scotland (GTCS)
- The Scottish Government

Teacher Numbers

There are now just 598 active Computing Science teachers left in Scotland.

Overall the number of Computing teachers in Scotland has gone down from 802 in 2005, to 649 in 2013, and now 598 in 2015. This is a drop of 51 teachers in the two years since we last surveyed, and a drop of 204 over the last ten years. This is the lowest number of any specialist teacher considered to be within either the Sciences, Technologies or Mathematics curricular areas.

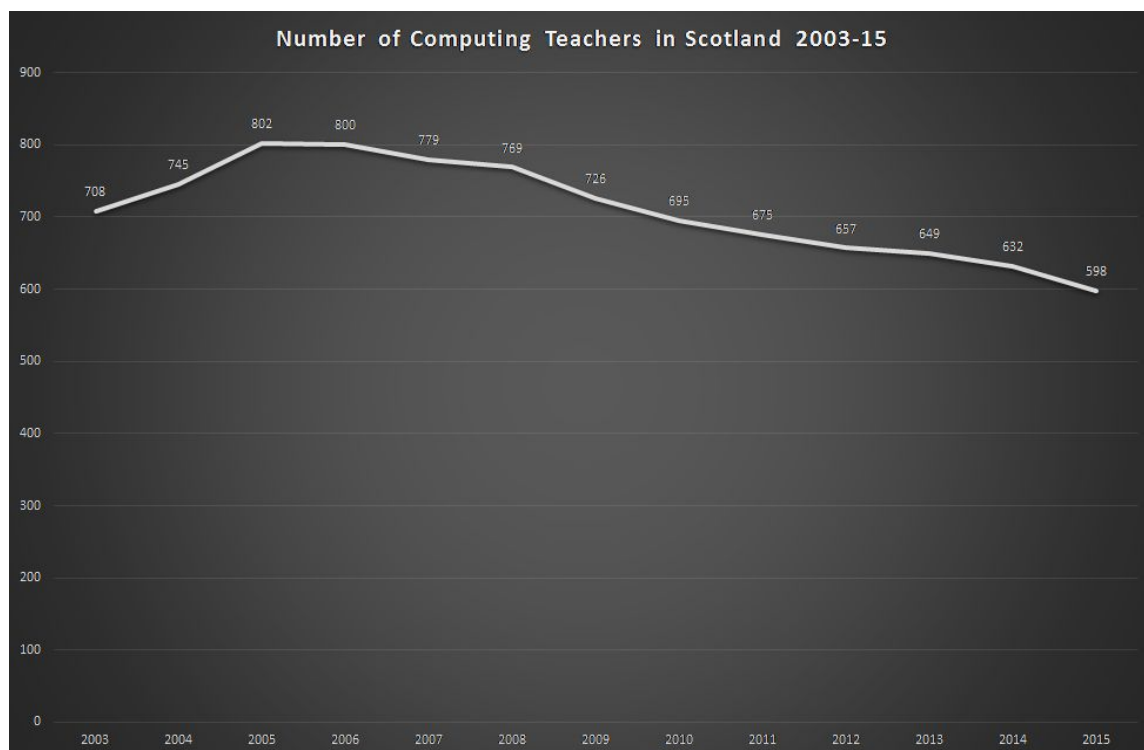


Figure 1: Number of CS Teachers 2003 - 2015

We compared number of schools in a local authority to number of teachers. This highlights the concerning situation in some local authorities that have far less CS teachers than schools. Councils with a healthy teacher to school ratio will be able to cope with shortages far better. Those with an even or negative teacher to school ratio are generally in the more remote areas of the country (Orkney, Eilean Siar, Shetland, Moray, Scottish Borders, Argyll & Bute, Dumfries & Galloway, and Highlands). Stirling, East Ayrshire and Aberdeen have only slightly more teachers than schools, so these are areas we are concerned about over the next couple of years.

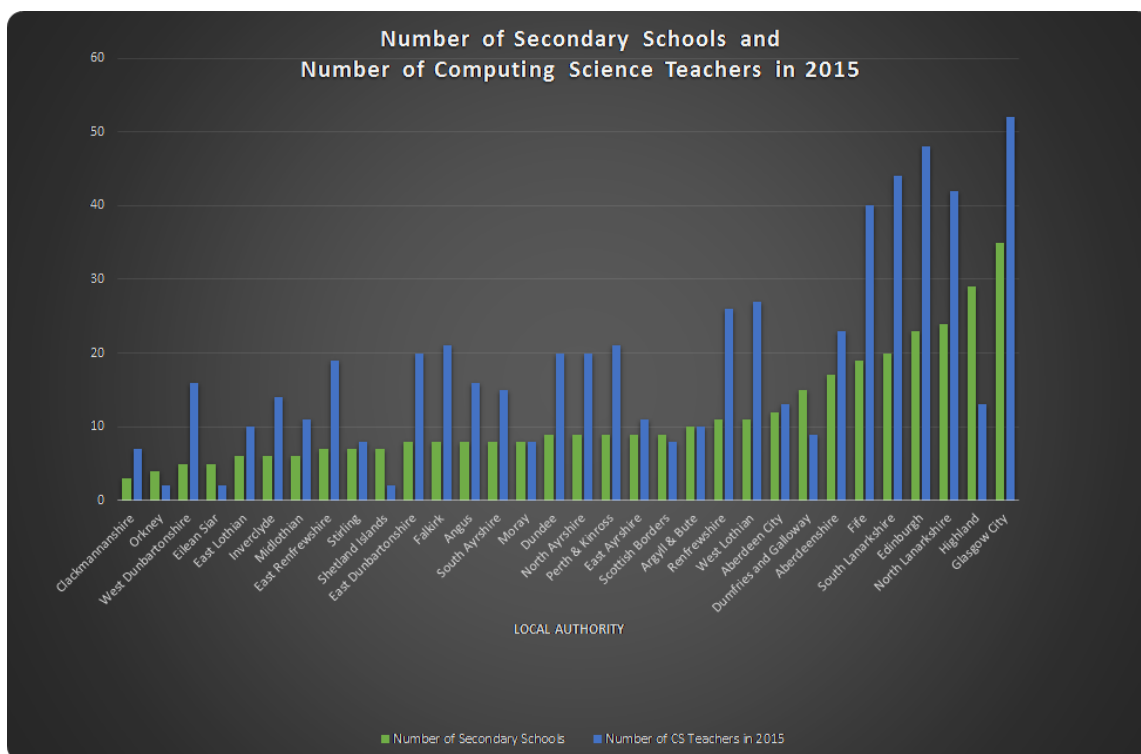


Figure 2: Number of Secondary Schools and CS Teachers in Scotland in 2015

A Decade of Decline

The number of Secondary pupils has decreased by 11% in 10 years.
The number of CS teachers has gone down by 25% in that time

We are now in the position of having ten years of data to analyse, from the peak years of 2005-6 until 2015-16. The number of Secondary pupils has gone down by 11% over the last ten years and accordingly the number of Secondary school teachers has also decreased. Unfortunately the number of Computing Science teachers has gone down disproportionately in comparison to the numbers of English and Maths teachers.

Subject teachers	Percentage difference
English teachers	-4%
Maths teachers	-6%
Physics teachers	-10%
Computing Science teachers	-25%

Table 1: Decrease in subject teachers between 2005 and 2015

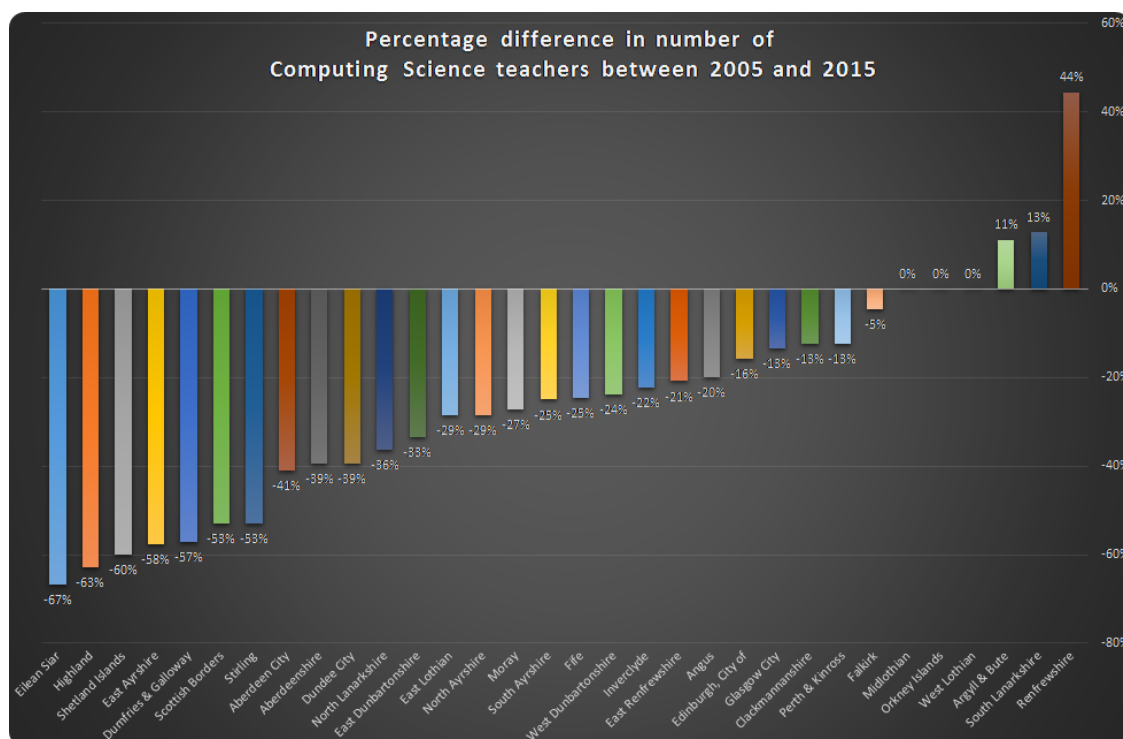


Figure 3: Percentage difference in number of CS teachers between 2005 and 2015

We can see that although three local authorities (Argyll & Bute, South Lanarkshire and Renfrewshire) have increased the number of CS teachers they employ, and three local authorities (Midlothian, Orkney and West Lothian) have the same number as ten years ago, the vast majority of councils have reduced the number of CS teachers they employ considerably.

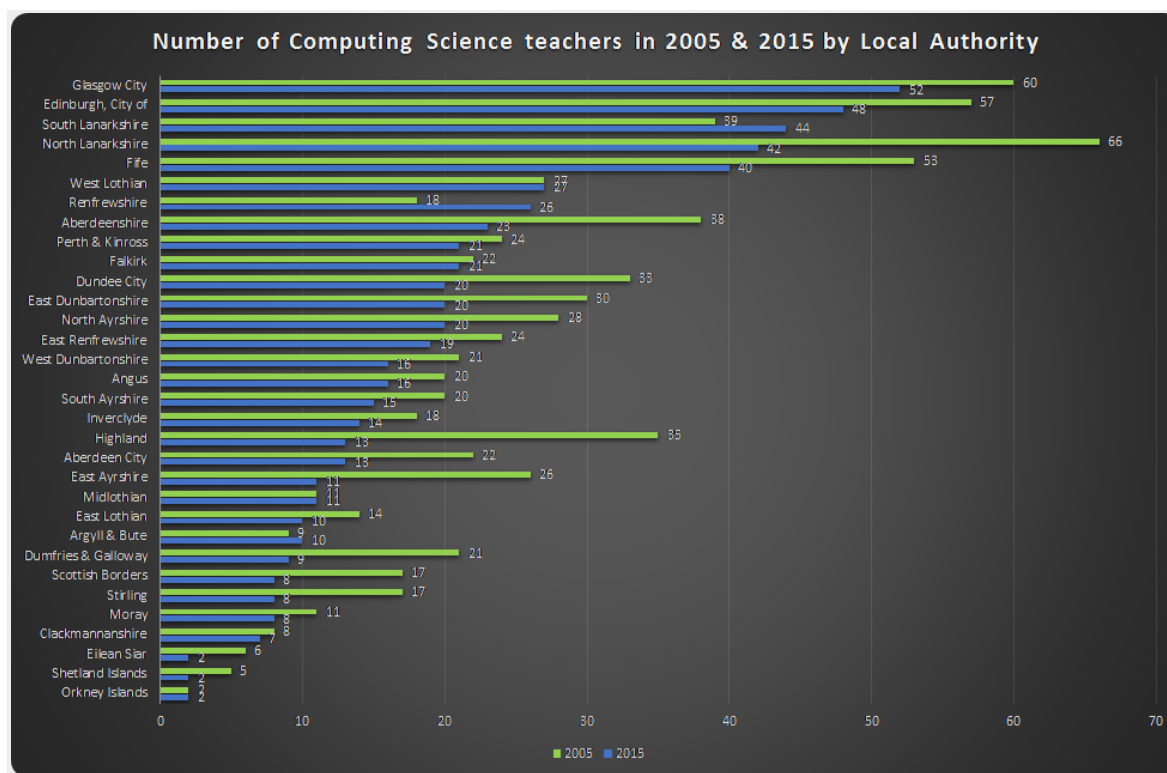


Figure 4: Difference in number of CS teachers between 2005 and 2015 in each Local Authority

Schools without subject specialists

17% of Secondary schools don't have a CS teacher.

Nationally we now have 17% of schools with no computing specialist. That is 62 secondary schools without a subject specialist to deliver the experiences and outcomes for the subject or to deliver certificate-level courses. This is an increase from 7.6% in 2012 (27 schools) and 12 % (43 schools) in 2014.

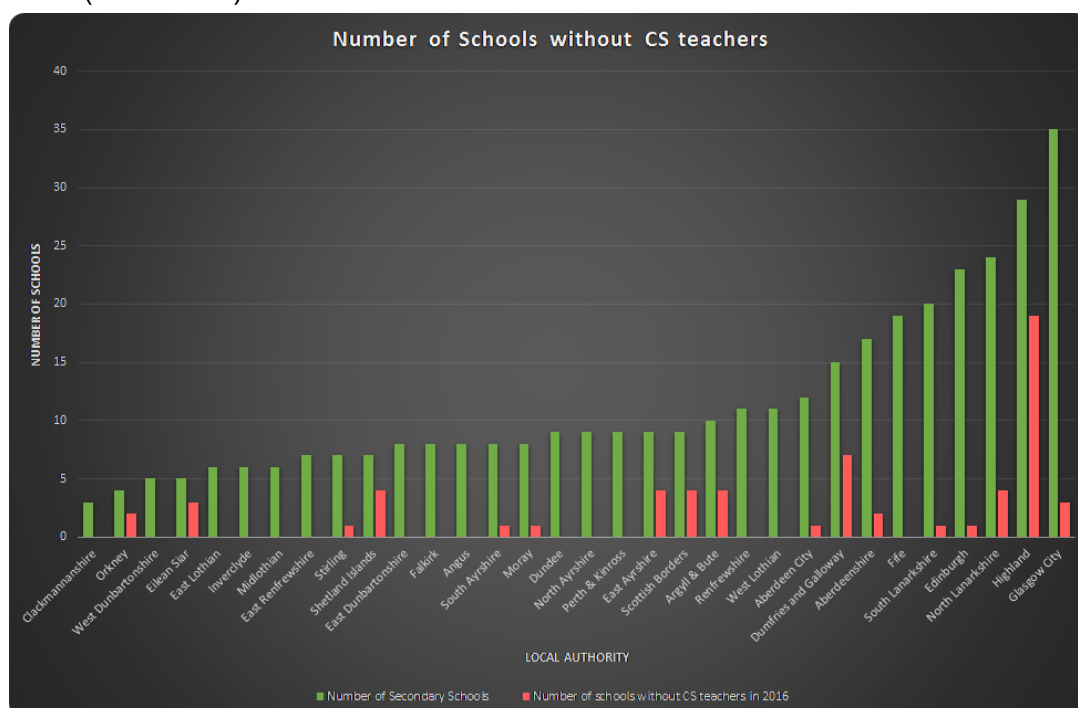


Figure 5: Total number of Secondary schools and Number without CS teachers

We saw in 2012 that there were a couple of local authorities where this was a greater problem. This seemed to be in the more geographically challenging areas of Highland Council, Dumfries & Galloway, Scottish Borders Council, Shetland Islands and Comhairle nan Eilean Siar. In addition, around a fifth of Glasgow Council schools didn't have a CS teacher in 2012.

The situation in the Scottish Borders has improved slightly with one more school with a subject specialist than two years ago, and Glasgow City has gone from 17% of schools without CS teachers in 2014 to 9% in 2016, with three schools gaining CS teachers.

Over half of Scottish local authorities now have schools without CS teachers.

A larger number of local authorities now have schools without CS teachers. There are now 17 local authorities with secondary schools without CS teachers, up from 12 in 2014. Four councils have had a significant increase in the number of schools without CS teachers over the last two years: Shetland has gone from 29% in 2014 to 57% in 2016; East Ayrshire has gone from 11% to 44%; Argyll and Bute was 10% in 2014 and is 40% now; and Aberdeenshire had doubled from 6% in 2014 to 12% now.

Six local authorities have joined the list since 2014. Orkney now has half of their schools with no CS teacher, North Lanarkshire has 4 schools in this situation (17%), and Stirling (14%), South Ayrshire (13%), Aberdeen City (8%) and Edinburgh (4%) each have one school without a subject specialist.

Fife has improved their situation in this regard. They previously had 5% of schools without a CS teacher, but now in 2016 all of their schools have at least one CS teacher. They have also reduced the number of schools with a single CS subject specialist from 37% in 2014 to 16% in 2016.

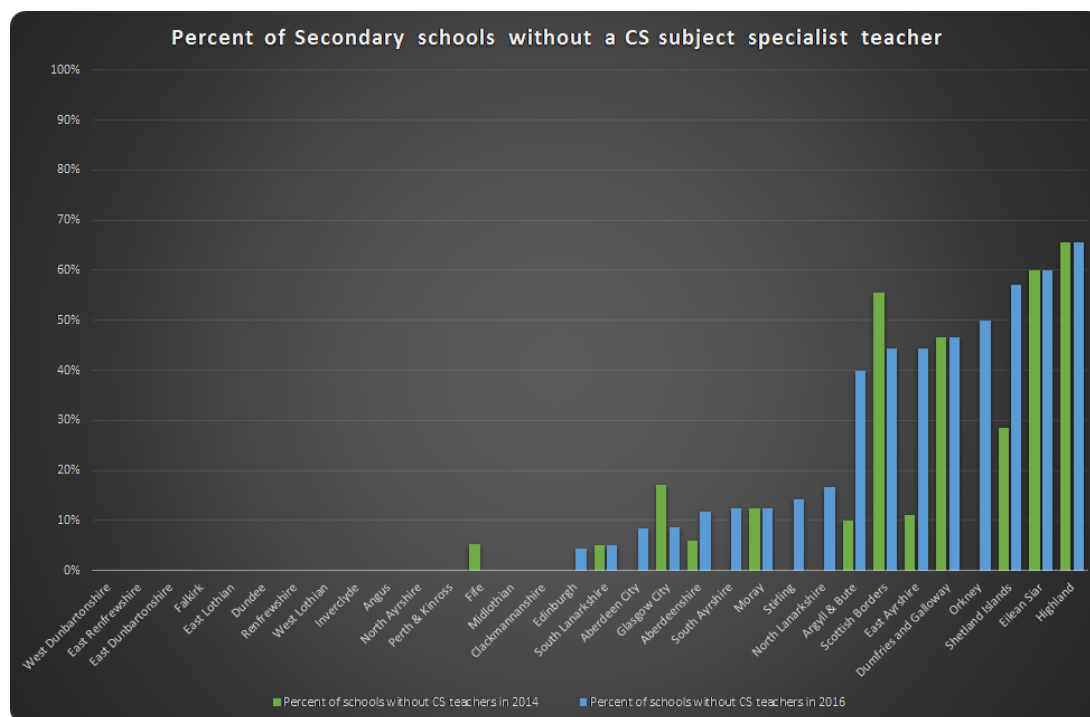


Figure 6: Percent of Secondary Schools without CS teachers in 2014 and 2016

Sole Computing Science Teachers

A quarter of Scottish Secondary schools have a sole CS teacher.

We are starting to see a trend that the schools with a single CS teacher are the most vulnerable to losing that teacher. Six councils that had a high number of schools with sole CS teachers in 2014 have seen an increase in schools without any CS teachers in 2016, accompanied by a decrease in sole CS teacher schools signifying that the sole teacher has left the school.

Council	Percent of schools with sole CS teacher in 2016	Percent of schools without CS teachers in 2016	Percent of schools with sole CS teacher in 2014	Percent of schools without CS teachers in 2014
West Dunbartonshire	0%	0%	0%	0%
East Renfrewshire	0%	0%	0%	0%
East Dunbartonshire	0%	0%	0%	0%
Falkirk	0%	0%	0%	0%
South Lanarkshire	10%	5%	0%	5%
East Lothian	17%	0%	0%	0%
Dundee	22%	0%	0%	0%
Renfrewshire	18%	0%	9%	0%
West Lothian	36%	0%	9%	0%
Scottish Borders	44%	44%	11%	56%
Edinburgh	22%	4%	13%	0%
Inverclyde	17%	0%	17%	0%
Eilean Siar	20%	60%	20%	60%
Angus	13%	0%	25%	0%
South Ayrshire	13%	13%	25%	0%
Stirling	29%	14%	29%	0%
Highland	31%	66%	31%	66%
North Lanarkshire	8%	17%	33%	0%
North Ayrshire	33%	0%	33%	0%
Perth & Kinross	33%	0%	33%	0%
Fife	16%	0%	37%	5%
Dumfries and Galloway	33%	47%	40%	47%
Glasgow City	31%	9%	43%	17%
East Ayrshire	11%	44%	44%	11%
Aberdeenshire	35%	12%	47%	6%
Moray	50%	13%	50%	13%
Aberdeen City	58%	8%	50%	0%
Midlothian	83%	0%	50%	0%
Shetland Islands	29%	57%	57%	29%
Argyll & Bute	30%	40%	60%	10%
Clackmannanshire	67%	0%	67%	0%
Orkney	25%	50%	75%	0%

Table 2: Percent of Schools with No CS Teacher and a sole CS teacher in 2014 and 2016

We suspect a number of factors are involved here. Firstly, it is extremely difficult to find a replacement teacher if the person in post leaves. Secondly, sole subject specialists have a difficult job, particularly in a period of curricular change, so individuals in that position might be more likely to be looking for an alternative post.

It is not easy to be a sole subject specialist in a Secondary school. Without a team of subject specialists then development work cannot be divided and shared, so one person has to do all of the work themselves. It is far more difficult to arrange verification with colleagues based at other schools rather than verifying within a department. We are also aware that class sizes are of particular concern to sole CS teachers, as there is more pressure to accept an increase in pupil numbers when a second class cannot be arranged due to staffing. Bi and tri-level class are also more likely for sole subject specialists. All of these pressures may be factors that result in sole teachers moving on to other schools or leaving the profession altogether.

We feel this is an area that requires more research. We also need to investigate ways in which sole subject specialists (both for CS and for other curricular areas) can be better supported in their existing school, ideally so that CS departments can develop and grow.

Ten local authorities have seen an increase in the number of schools with sole CS teachers. This concerns us as we feel these schools are at greater risk in future. Fortunately, three local authorities (Angus, Fife and Glasgow) have managed to improve their situations over the last two years and reduce the number of schools with sole CS teachers.

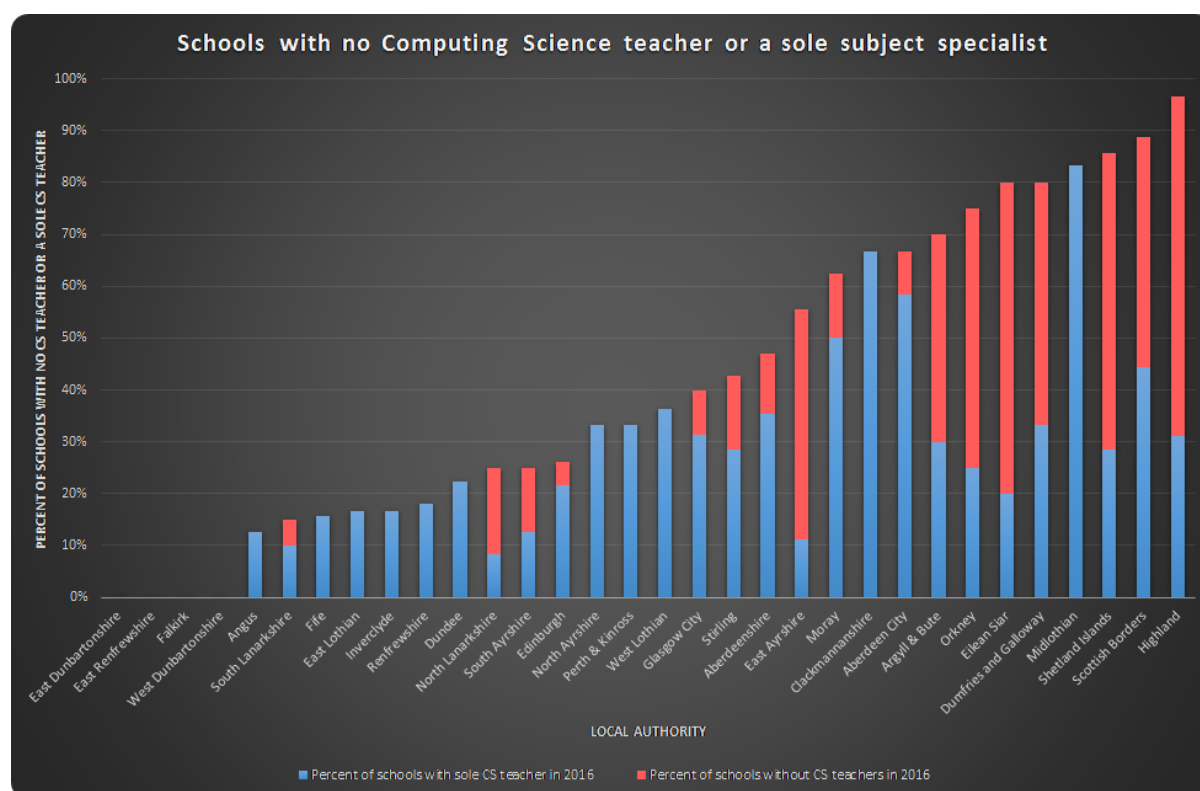


Figure 7: Percent of schools without a CS teacher and percent of schools with a sole CS teacher in 2016

Recruitment and Supply

Almost half of all Local Authorities have reported difficulties recruiting Computing Science teachers in the last year

There has been an increase in vacancies for computing teachers from 21 (66%) to 24 (75%) out of the 32 local authorities between 2014 and 2016. Three-quarters of local authorities have advertised at least one CS teacher post in the last year.

The number of local authorities reporting difficulties with recruiting suitable candidates has risen from 34% to 47%.

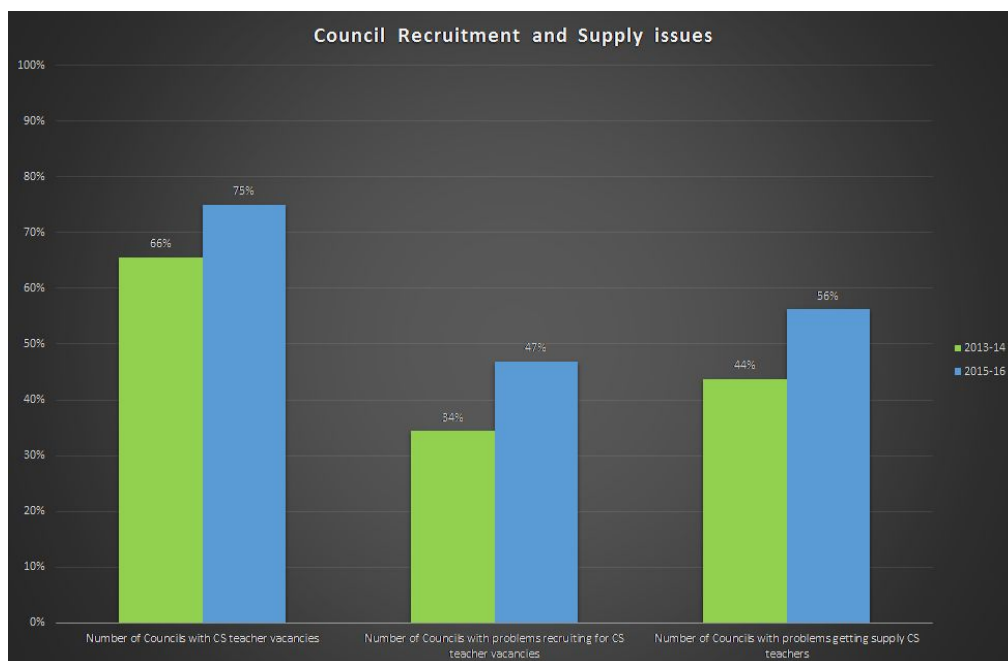


Figure 8: Council recruitment and supply issues 2014 and 2016

“We have been unable to recruit after three attempts”

“[We’ve seen a] lack of Candidates with GTCS Registration”

“Lack of suitable applicants”

Quotes from Local Authority responses to FOI requests

Even where a post was filled, there have been many instances where only one or two suitable candidates applied.

**“We only had one applicant for advertised post in January.
We appointed this candidate.”**

**“Experienced an issue with recruiting in terms of both attracting applications and also
attracting appointable candidates. ...4 posts only had one applicant, 2 posts had two
applicants each.”**

Quotes from Local Authority responses to FOI requests

In addition, local authorities have had difficulties in getting Computing supply cover. The number of local authorities that reported difficulties securing Computing specialist supply cover, has increased from 44% to 56%.

**"Due to the shortage in Computing Teachers, schools have had to use alternatives to
cover short-term vacancies, which include moving staff from other areas who are
dual-qualified to cover the vacancies and backfilling their post."**

Quote from Local Authority response to FOI request

Teacher Training

There are two thirds less new teachers entering the profession than there were ten years ago.

In 2005 there were 85 new registrations in Computing with the GTCS compared to just 26 in 2015, a decrease of 69% over the last ten years. Statistics from the Scottish Government show that Computing has the lowest replenishment rate of all subjects. There are not enough new teachers training and entering the profession to replace the teachers who are leaving or retiring.

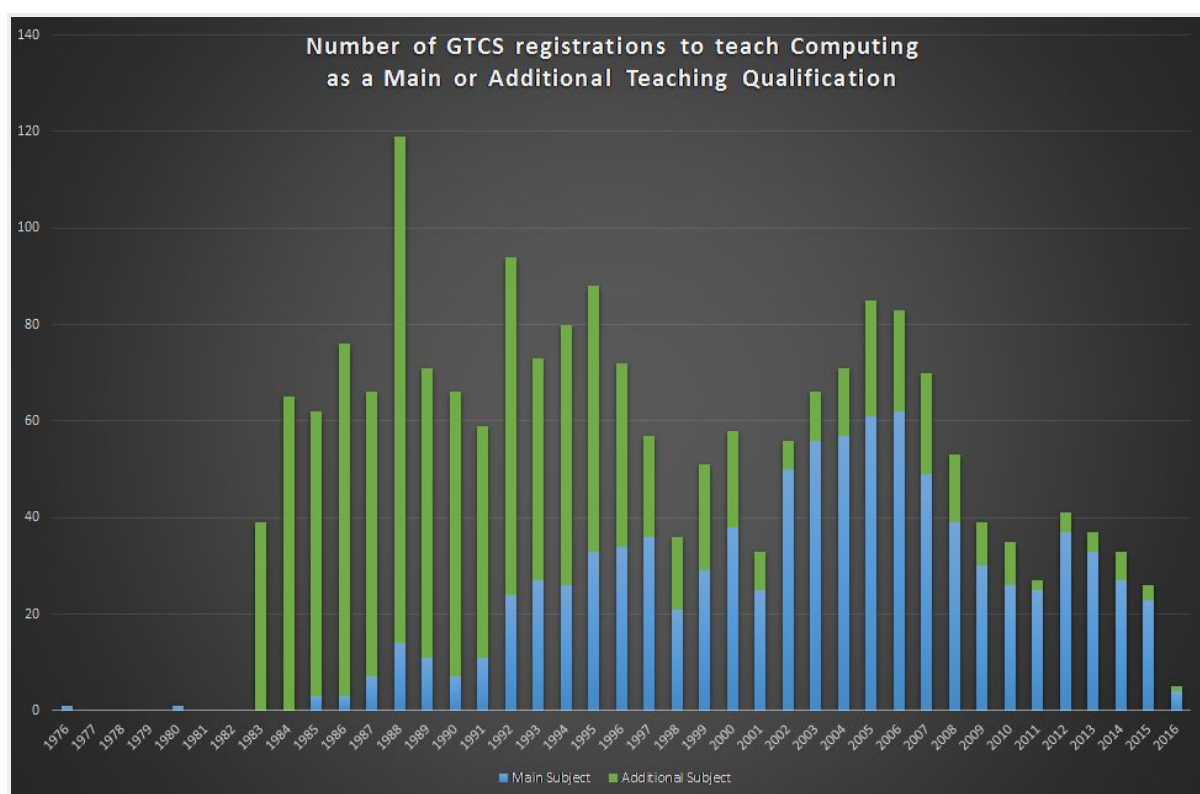


Figure 9: Number of teachers registering with GTCS to teach Computing as a main or additional subject.

The number of training places was increased by the Scottish Government from 2014 onwards but the Initial Teacher Education institutions have failed to fill places they have been allocated due to a lack of quality applicants that meet the standards for initial teacher education.

While we are pleased that the Scottish Government has recognised the problem with replenishment of CS teachers, we are concerned that Initial Teacher Education Institutions are failing to find enough high quality applicants with recent experience of volunteering in schools or shadowing teachers. This has resulted in unsuitable applicants being accepted for PGDE courses. In the 2015-16 cohort, eight PGDE students accepted places at the

University of Glasgow to specialise in Computing education. Only three of those eight students completed the course, and only two of them went onto the Scottish Teacher Induction scheme.

We currently don't have enough teachers to replace the large number of teachers who will retire in the next 10 years and we have the lowest replenishment rate of all subjects. We need new approaches to this problem. All undergraduate Computing Science students at universities across Scotland need to be aware of Education as an attractive career path. We also need more potential career-changers to be aware of Teaching as a career. This will require a national publicity campaign. It is hoped that Skills Development Scotland will take on this challenge as part of the Skills Investment Plan for IT.

We also need alternative course options for potential students if the current PGDE courses are not suitable or attractive to them. This might be to do with the course content, delivery, location or the format. We encourage the Scottish Government, the Scottish Funding Council and Scottish Universities to investigate possibilities for high quality teacher training courses that will attract new teachers into Computing Science education.

Induction Scheme

The number of newly qualified teachers entering the induction scheme each year has not increased over the last two years.

In 2016 only 20 newly qualified teachers have joined the teachers' induction scheme. This is the same as in 2014, when we last asked the GTCS for this information.

We have been informed of one case this year where a newly qualified teacher has gone into a teaching post direct from completing the PGDE course and has not needed to be placed by the GTCS. It is therefore possible the number of new teachers is higher than the number going in through the official route, particularly as schools face a shortage of applicants and may be more willing to consider applicants direct from Initial Teacher Education.

It is also possible that newly qualified teachers might head off to English schools instead, and we are aware of one newly qualified teacher who has chosen this route in the last year. English schools are trying to introduce Computing into the curriculum but don't have a large pool of qualified subject specialists. They also have more flexibility in terms of salary, which may be attractive to new teachers.

Staff Retention

There are 2698 teachers registered to teach Computing but only 598 currently teaching the subject.

The GTCS reports that in July 2016 there were 2698 teachers registered with Computing as their main or additional subject. That is a huge number compared to the current figure of 598 teachers of Computing in the Scottish Government annual census in November 2015.

It is not known how many of the 2100 other teachers are not currently teaching at all but continue to be registered, and how many are teaching other subjects. If a substantial number are not currently teaching then it would be interesting to find out their reasons for leaving, whether they are interested in returning, and the professional learning that they would require to support their return to the classroom.

Changes to working conditions due to CfE and austerity have eroded existing conditions making it much harder to retain existing new or experienced staff. Major problems are the growing number of schools with increased Computing class sizes, teachers being asked to teach multiple qualifications and levels concurrently, and unpaid coursework marking for the SQA.

Class Sizes

We have seen an increase in the number of CS teachers teaching large class sizes. Historically schools have included Computing as a practical subject despite the fact that subjects like Graphic Communication (using a computer to create 2D and 3D designs) and Administration and IT (using a computer to learn office applications) are included in the SNCT list of practical subjects. Computing Science (programming a computer to model and process information) did not exist when the list was first drawn up and the subject has never made it onto the list.

These large classes are normally accommodated in rooms that were not designed for that number of pupils and computers. There is an impact on marking time as well, particularly as it takes far longer to mark a computer program than it does mark a spreadsheet in Administration and IT, for example. Sitting waiting for a teacher to debug problems in a class of 33 is also not going to result in a satisfying or engaging educational experience for learners either.

Multiple Concurrent Qualifications

Computing teachers are being asked to teach bi-, tri- or even quad- qualification classes. There needs to be an understanding that National 4, National 5, Higher and Advanced Higher Computing Science are very different qualifications and that these courses do not articulate in the same way as the three levels of the old Standard Grade qualification. It is the learners that are losing out when multiple qualifications are being taught concurrently, and it is an extremely tough and stressful situation to be in as a teacher. This is not a sustainable situation and will result in teachers leaving as well as lower uptake and attainment by students.

Unpaid SQA Coursework Marking

Computing at School Scotland have previously reported on teachers' concerns over additional coursework workloads that adversely affects their capacity for supporting students. It is important that SQA urgently looks at this issue given the current severe shortages of teachers, to ensure that teaching capacity is not affected by this issue.

Recommendations

- We need more research into sole subject specialists. We need to find out if they are more adversely affected by issues such as large class sizes and limited development time. We need to find out if they are more likely to be teaching multiple concurrent qualifications and more likely to want to leave teaching than teachers in larger CS departments.
- We need local authorities to investigate ways in which sole subject specialists (both for CS and for other curricular areas) can be better supported in their existing school, ideally so that CS departments can develop and grow.
- We currently don't have enough teachers to replace the large number of teachers who will retire in the next 10 years and we have the lowest replenishment rate of all subjects. We need new approaches to this problem. All undergraduate Computing Science students at universities across Scotland need to be aware of Education as an attractive career path. We also need more potential career-changers to be aware of Teaching as a career. This will require a national publicity campaign. It is hoped that Skills Development Scotland will take on this challenge as part of the Skills Investment Plan for IT.
- We need alternative course options for potential students if the current PGDE courses are not suitable or attractive to them. This might be to do with the course content, delivery, location or the format. We encourage the Scottish Government, the Scottish Funding Council and Scottish Universities to investigate possibilities for high quality teacher training courses that will attract new teachers into Computing Science education.
- It is possible that newly qualified teachers might head off to English schools instead of joining the Scottish induction program as they have more flexibility in terms of salary, which may be attractive to new teachers. We need more data about retention rates in teacher training and during induction and factors that affect retention. We need more information about destinations of the teachers that leave the system.
- We need more information about the schools where newly qualified teachers are placed for their induction year to find out how the retention rates for probationers working in a school with at least one other CS teacher compares to probationers placed in a school as the sole subject specialist.
- There are 2698 teachers registered with the GTCS with Computing as their main or additional subject yet only 598 are actively teaching the subject. It would be useful to find out how many of the 2100 other teachers are not currently teaching and how many are teaching other subjects.
- For those people registered to teach CS but not currently teaching at all, it would be useful to find out their reasons for leaving, whether they are interested in returning,

and the professional learning that they would require to support their return to the classroom.

- We need Computing Science added to the SNCT list of Practical Classes. Large CS classes are normally accommodated in rooms that were not designed for that number of pupils and computers. There is an impact on health and safety, marking time, learner engagement and student uptake.
- Computing teachers should not be asked to teach bi-, tri- or even quad- qualification classes. Learners that are losing out when multiple qualifications are being taught concurrently, and it is an extremely tough and stressful situation to be in as a teacher. This is not a sustainable situation and will result in teachers leaving as well as lower uptake by students. We call on schools and local authorities to recognise the negative effects of multiple qualification and multiple level classes, and to reduce their dependence on them.
- Computing at School Scotland have previously reported on teachers' concerns over additional coursework workloads that adversely affects their capacity for supporting students. It is important that SQA urgently looks at this issue given the current severe shortages of teachers, to ensure that teaching capacity is not affected by this issue.
- We have lost a significantly higher proportion of Computing Science teachers over the last ten years compared to other subjects. **We call on schools, local authorities and government bodies to protect, respect, value and support the teachers currently in post, before we lose them too.**