

# **The Deployment of Science Teachers in 2019: A Comparative Analysis**

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# 1. Executive summary

## 1.1 Methodology

- This report is largely based on analysis of the Schools Workforce Census (SWFC), which contains data on teachers in state-funded schools in England. We look at the 2018/19 academic year, the most recent for which data is available to us.
- Science teachers have been identified as any teachers who spent time teaching either science or an individual science subject.
- We identify the degree subjects studied by science teachers to provide an overview of the balance between qualifications in the three main science subjects, and the proportion of science teachers with no science degree.
- We also identify their level of teaching experience, broken down into those with at least three and at least five years of experience, and finally we identify whether they were working in the same school as they had been in the previous year, to give an overview of the levels of retention.
- We look at the above broken down by region and school type.
- Comparisons between state and independent schools are made based on data collected as part of a survey of independent schools, carried out between November 2021 and January 2022.

## 1.2 Main findings

- Of those teachers for whom data on degree subject was available, the majority of those teaching science (73%) had a degree in science. The most common degree subject for science teachers was biology; 26% of those science teachers for whom data was available held a biology degree. We should note that we excluded those teachers for whom we did not have complete data on qualifications from this part of the analysis.
- The balance between the three main science subjects was poor. 26% of science teachers had a degree in biology, 15% chemistry and just 11% physics or engineering.
- Just under a third (31%) of science teachers had at least three years of recent teaching experience and 19% had at least five. This is lower than the levels of recent experience for all teachers (34% and 21%) but similar to English and maths teachers.
- 71% of science teachers were in the same school in 2019 as in the previous year. Again, this is slightly lower than the level for all teachers (73%) but similar to English and maths teachers.
- No one region has a markedly better balance between the three main sciences. The North West had particularly high levels of experience, while the South East had the lowest levels. Retention was particularly low in London. Levels of experience and retention in science were generally similar to those in maths in all regions.

- Schools with a sixth form have a better balance between the three main sciences than those without, as do selective and single sex schools. Those with a sixth form have similar levels of experience and slightly higher retention among science teachers, while selective and single sex schools have markedly higher levels of both. The same was also true for maths teachers.
- Schools with a higher proportion of triple science entries have a higher proportion of teachers with a science degree, and particularly with a physics degree, than those that do not. They also have higher levels of experience and retention, although again this is also the case for maths teachers.
- While we need to be cautious in comparing the results of our 2021/22 survey of independent schools to our analysis of state-funded schools using 2019 SWFC data, it does appear that independent schools have a higher proportion of teachers with degrees in each of the three main sciences and a better balance between the three. Science teachers also appear to have much higher levels of experience and retention in independent schools.

### 1.3 Limitations

- The limitations of this analysis are largely due to the sometimes poor quality of the data in the School Workforce Census (SWFC).
- High levels of missing data mean that we were forced to exclude some schools and some teachers from the analysis.
- This included teachers for whom no curriculum data was returned and those for whom data on qualifications was missing or incomplete.
- Finally, in some cases schools did not complete the census every year, meaning that calculating historic information such as experience or retention was challenging.
- This report draws comparisons between information obtained from analysis of 2019 SWFC data and a survey of independent schools, carried out in 2021/22. While efforts have been made to make the analysis as comparable as possible, some differences in the findings may be due to the differing methodologies and years covered.
- The survey attracted more responses from schools with sixth forms and larger schools. This may have led to some bias in the results; as shown elsewhere in the report, state schools with sixth forms do tend to have more science teachers with degrees in the three main sciences, and higher levels of experience and retention.

## 2. Introduction

This report provides an analysis of how science teachers are deployed in schools in England, based on data from the Schools Workforce Census (SWFC) and a survey of independent schools. We focus on three areas: qualifications, experience and retention, looking at the situation in the 2018/19 academic year, the most recent for which data is available to us.

Previous work<sup>1</sup> has shown that science teachers with a degree in biology outweigh those with degrees in chemistry and especially physics. Efforts have been made to improve the balance between the three main science subjects, including scholarship schemes that provide fully-funded access to teacher training for those wishing to specialise in physics or chemistry (among other subjects). Our intention is to provide insight into whether the balance between science teachers with backgrounds in biology, chemistry and physics has improved in recent years.

Research has also indicated<sup>2</sup> that rates of retention may be lower for science teachers than for other teachers, particularly in the early years of their career. Here, we examine retention by looking at the proportion of science teachers who are teaching at the same school in 2019 as they were in 2018, thus providing a snapshot. In addition to looking at retention directly, we also look at the levels of recent experience among science teachers and draw some comparisons to teachers of other subjects.

As well as reviewing the situation nationally, we consider how the deployment of science teachers varies by school type and region.

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<sup>1</sup> *Mathematics and Science in Secondary Schools*, Moor et al (2006), accessed at <https://www.nfer.ac.uk/publications/DMS01/DMS01.pdf>

<sup>2</sup> *Improving Science Teacher Retention*, Allen and Sims (2017), accessed at <https://wellcome.org/sites/default/files/science-teacher-retention.pdf>

### 3. Data and definitions

#### 3.1 Schools Workforce Census

The bulk of the analysis was carried out using the Schools Workforce Census (SWFC). This is an administrative dataset, collected and maintained by the Department for Education. It contains demographic, employment, absence, qualification and curriculum data on teachers working in state schools in England.

Our analysis is focused on the deployment of science teachers in 2019, the most recent year for which data was available to us. In order to construct information on experience and retention, we used data from the 2014-19 censuses.

The SWFC has the advantage of scale; it covers all state schools in England. However, it suffers from sometimes poor data quality, with high levels of missing data. Of particular concern for our analysis is missing data from the curriculum, qualifications and staff contract / service agreement modules. These are used to identify who is teaching science, what qualifications they have and the hours that they work, respectively.

**Table 1: Number of schools submitting curriculum data to the SWFC by year**

Year	No. submissions	No. eligible schools
2015	2858	3481
2016	2849	3548
2017	2846	3503
2018	2871	3301
2019	2923	3441

As shown in table 1 above, around only 80% of schools submit curriculum data to the SWFC each year. Without this information, we are unable to identify which teachers are science teachers, and so are forced to exclude those schools who have not submitted this data from our analysis.

Of those schools that do submit data, some submissions are incomplete. In 2019, full data on degrees obtained was provided for just 73% of the teachers recorded in the census. The remaining teachers either had no information recorded in this module, or had no valid degree subject recorded. A slightly higher proportion of teachers (82%) had full data on at least one qualification recorded; this includes qualifications such as PGCEs.

As we are therefore unable to reliably identify the qualifications held for these teachers, we exclude them from our analysis of qualifications, although we also provide some indication of the level of missingness for science teachers in section 5.1.

Some schools do not submit data to the SWFC every year; for these schools, we had difficulty calculating the experience and especially retention measures for teaching staff which rely on looking back at data from previous years. Because of the various exclusions, the number of teachers included in the sections of this report focusing on qualifications, experience and retention are not exactly the same. Table 2 shows the total numbers included for each area of interest.

**Table 2: Number of teachers included by area**

Area	No. science teachers
Qualifications	22456 <sup>3</sup>
Experience	27141
Retention	27246

### 3.2 Independent schools survey

As the SWFC does not include data on independent schools, we carried out a survey to collect comparable data from the sector. This was initially sent out to heads of science in 659 schools – we excluded international schools and any small schools with less than 100 pupils. An initial mailing was sent in November 2021 and a follow up in January 2022. Responses were received from 85 schools.

Schools were given the option of completing a paper survey to be returned by post or an online version. Each survey, completed by the head of science, included information on all science teachers in the school. The breakdown of returns by type is shown in the table below, including the total number of teachers on whom information was received.

**Table 3: Number of survey responses by type**

Type	No. schools	No. teachers
Online	34	448
Paper	51	525
Total	85	973

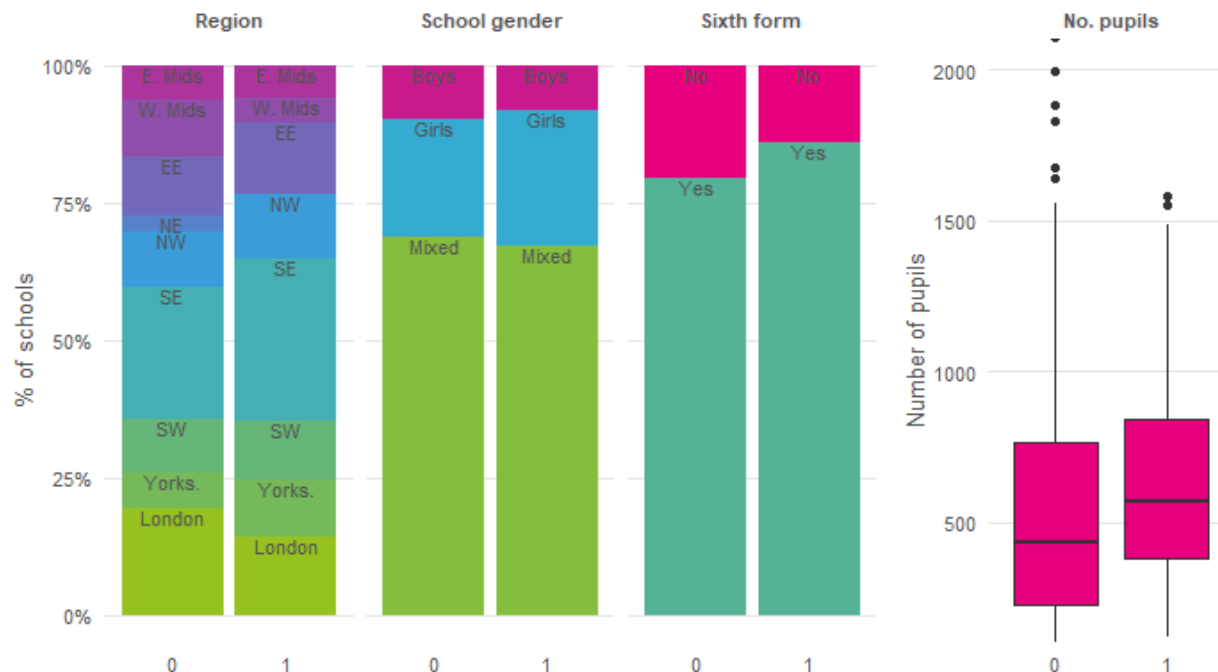
The online survey required responses to almost all of the questions, but with the paper version there was no way to ensure that all questions received a response. For this reason, where schools returned both an online and a paper survey, we chose to use the responses from the online survey. This affected two schools.

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<sup>3</sup> Some of these teachers were excluded from the final analysis due to missing data on degree subject. Much of the analysis uses a reduced sample. See section 5.1 for more information.

Below we present a brief summary of how the responding schools compared to the 574 schools to which we sent the survey but did not receive a response.

**Figure 1: School characteristics by response to independent schools survey (0 = did not respond, 1 = responded)**



Schools with a sixth form and those with more pupils were somewhat more likely to respond to the survey, perhaps because these schools are likely to have larger science departments. We received no responses from schools in the North East but every other region was represented. There is no indication that single sex or mixed schools were more likely to respond to the survey.

The higher level of responses from schools with a sixth form is a cause for caution when comparing results of the survey to data on state-funded schools; schools with a sixth form may be likely to higher levels of qualifications, experience and retention than those without a sixth form. However, the difference is not huge; 87% of responding schools had sixth forms compared to 80% of non-responders.

### 3.3 Definitions

We define a science teacher as a teacher who spent time teaching either science or an individual science subject. Ideally, we would also identify science teachers as being predominately specialists in one of the three main science subjects: biology, chemistry or physics. Unfortunately, we are not able to reliably do this using the SWFC due to high levels of missing data.

We define a degree as including a first degree, a master's degree or a doctorate.

We define experience based on how many years a teacher has been observed to be teaching between 2014 and 2019, the years covered by our dataset. This could perhaps better be described as 'recent experience', but was selected because other potential measures of experience in the SWFC, such as the number of years since entering teaching, suffer from high levels of missing data.

Retention is measured simply by observing whether a teacher was teaching in the same school in 2018 in which they were teaching in 2019.

This work contains statistical data from ONS which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.



## 4. Working patterns

In this section, we present a brief overview of science teachers' working patterns. We compare these to those of maths and English teachers to provide context. This analysis uses the sample of teachers used to analyse levels of experience, including 27141 teachers in total.

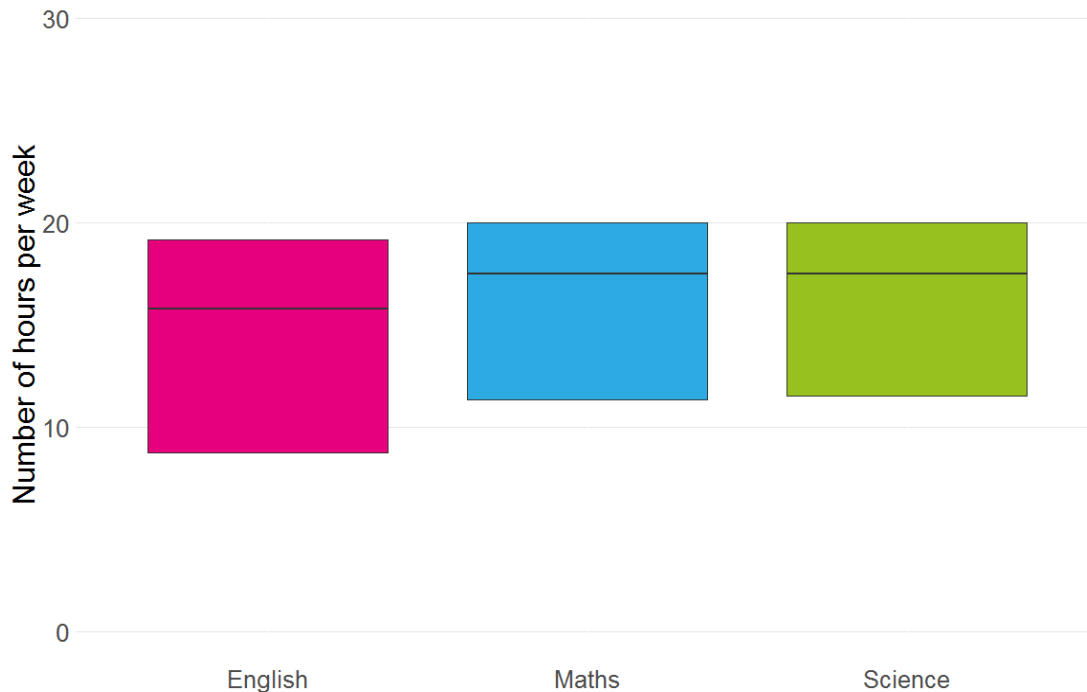
The vast majority of science teachers in our sample exclusively taught science, but a small group (5%) also taught another subject, almost exclusively maths. Of these, the majority (52%) primarily taught science with some maths, while the remaining 48% either primarily taught another subject with some science, or split their time equally between two subjects.

**Table 3: Proportion of science teachers by subject taught**

Teaching pattern	N	%
Science only	25844	95
Mostly science, with another subject	680	3
Mostly another subject, with science	552	2
Equal split between science and other	65	0

As shown in figure below, the number of hours that science teachers spend teaching is very similar to maths teachers, although slightly higher than English teachers.

**Figure 2: Distribution of hours worked per week by teaching subject**



On average, science teachers spend 15 hours per week teaching science. This is the same as maths teachers spend teaching maths, while English teachers spend 14 hours a week teaching English.

## 5. A profile of the science teacher workforce

In this section, we summarise the indicators we have created about the science teacher workforce. These cover qualifications, experience and retention. It is based entirely on analysis of the Schools Workforce Census (SWFC) and includes teachers from state-funded schools in England.

### 5.1 Qualifications

In this section, we look at the proportion of teachers with degrees in each of the three science subjects: physics, chemistry and biology.

We will also look at those with a degree in other science subjects, as well as those with science qualifications other than degrees. We break down *other science subjects* into three categories: engineering, sports science and other. Engineering is included because of its relevance to physics and sports science because it is by far the most popular individual degree subject outside the three main sciences.

We have defined degree subject based on JACS codes. The full list of codes and how we defined their respective subjects are included as an appendix (see section 9).

Unfortunately, due to incomplete data in the SWFC, we were unable to identify degree subjects for all of the teachers in our sample – having already excluded those for whom no data on qualifications was recorded at all. See section 3.1 for further discussion of missing and incomplete data in the SWFC and how we have dealt with it in this analysis.

**Table 4: Proportion of science teachers by degree subject recorded**

Qualification	N	%
Degree in science	14802	66
Other degree	5579	25
Record incomplete	2075	9

Qualification data is incomplete for 9% of the teachers in our sample. For these teachers, we are unable to determine the subject of their degree due to missing or invalid data.

We therefore exclude these teachers from the rest of our analysis of qualifications, including only those teachers for whom we've been able to identify a degree subject. This gave a final sample of 20381 teachers.

**Table 5: Proportion of science teachers by degree subject**

Qualification	N	%
Degree in biology	5198	26
Degree in chemistry	3010	15
Degree in physics	1674	8
Degree in engineering	624	3
Degree in sports science	893	4
Degree in two or more science subjects	477	2
Degree in another science subject	2926	14
No degree in science	5579	27

We found that the majority of science teachers for whom complete data was available (73%) held a degree in a science. The most common degree subject was biology (26%) followed by chemistry (15%) and other sciences (14%). Just 8% of teachers held a physics degree, although if engineering is included this increased to 11%.

Unfortunately, due to high levels of missing data on the subject of alternative qualifications, we are unable to reliably identify how many of the teachers who do not have science degrees do have other post-graduate science qualifications, such as PGCEs in science.

## 5.2 Experience

In this section, we look at how much recent teaching experience science teachers have.

We have broken science teachers down into those with at least three years of recent teaching experience and those with at least five years of recent teaching experience. The proportion of teachers who fall into each category is summarised in the table below.

**Table 6: Proportion of teachers by subject and level of recent experience**

Level of experience	All	Science	Maths	English
3 years or more	34	31	30	30
5 years or more	21	19	18	16
Total no. teachers	161367	27141	25409	27698

A lower proportion of science teachers have at least three or at least five years of experience than the overall population of teachers included in our sample. However, we also include English and maths teachers here; as subjects that, like science, are universally taught in secondary schools, they make a useful comparison.

The level of recent experience among science teachers is very similar to that among maths and English teachers; all three are below the levels seen for the overall population of teachers.

### 5.3 Retention

This section looks at the proportion of teachers who were observed to be teaching in the same school in 2019 as they were the previous year. As well as the proportion of science teachers, we also include the proportions for teachers of all subjects and of English and maths for comparison.

This information is summarised in the table below.

**Table 7: Proportion of teachers by subject and retention**

Subject	N	% retained
All	118750	73
Science	19445	71
Maths	18226	71
English	19782	71

Science teachers were slightly less likely to remain at the same school than the general population of teachers. However, the same was true of both maths and English teachers.

## 6 Deployment by region

In this section, we look at how the deployment of science teachers varies by region. The analysis in this section is based solely on data from the Schools Workforce Census and covers teachers in state-funded schools in England.

The proportion of teachers with degrees in science subjects is shown in table 8 (overleaf).

There are some intriguing differences between regions, although overall the picture is broadly similar. In all regions, the majority of science teachers hold a science degree, and the most common degree subject is biology. All regions have poor balance between the three main science subjects; those with biology degrees far outnumber those with chemistry and especially physics degrees.

The South West has the highest proportion of teachers with a science degree, and London the lowest. The South West also has the highest proportion of physics teachers, but it still doesn't have a good balance between the three main subjects; it also has the highest proportion of biology teachers and the lowest proportion of chemistry teachers.

The levels of experience and retention, for science teachers as well as teachers of selected other subjects, are shown in tables 9 and 10 (overleaf).

Levels of experience among teachers of science are particularly low in London and the South East, although this is also true of English and maths. In general, levels of experience in science are similar to those in maths, although in both the North East and the North West experience in science is slightly higher. However, in every region the levels of recent experience in science are lower than the levels for the overall teaching population.

As we might expect, regions with higher levels of recent experience tend to also have higher levels of retention. The West Midlands and London have the lowest retention levels, particularly in maths and science. The North East and North West have slightly higher retention in science than in maths, while in other regions these figures are similar.

**Table 8: Proportion of science teachers by degree and region**

Qualification	%: East Midlands	%: East of England	%: London	%: North East	%: North West	%: South East	%: South West	%: West Midlands	%: Yorks. & Humber
Degree in biology	27	26	23	25	26	26	31	29	24
Degree in chemistry	16	14	16	15	16	13	12	15	19
Degree in physics	9	8	8	9	8	9	9	8	7
Degree in engineering	3	3	4	4	3	3	3	3	3
Degree in sports science	5	6	4	3	4	6	4	4	3
Degree in another science	14	15	14	16	14	16	16	14	15
No degree in science	26	29	31	28	30	27	25	27	28

**Table 9: Proportion of science teachers by level of recent experience and region**

Subject	Level of experience	%: East Midlands	%: East of England	%: London	%: North East	%: North West	%: South East	%: South West	%: West Midlands	%: Yorks. & Humber
All	3 years or more	35	32	32	41	41	32	33	34	35
All	5 years or more	21	19	20	22	28	18	21	21	22
Science	3 years or more	32	30	30	39	38	29	30	30	32
Science	5 years or more	19	17	18	19	25	16	19	18	19
Maths	3 years or more	32	30	29	33	35	29	30	29	30
Maths	5 years or more	18	17	18	16	22	15	17	16	17
English	3 years or more	28	28	28	38	35	27	27	30	30
English	5 years or more	16	14	16	19	21	12	15	16	17

**Table 10: Proportion of teachers retained by subject and region**

Subject	%: East Midlands	%: East of England	%: London	%: North East	%: North West	%: South East	%: South West	%: West Midlands	%: Yorks. & Humber
All	75	75	69	75	76	73	76	72	72
Science	72	74	68	75	75	70	73	69	70
Maths	74	73	68	72	73	71	74	69	70
English	72	73	67	74	74	71	74	70	69

## 7 Deployment by school type

In this section, we look at how the deployment of science teachers varies by school type. Sections 7.1 to 7.4 are based solely on data from the Schools Workforce Census, covering state-funded schools in England. Section 7.5 compares data on state-funded schools, obtained from the SWFC, to data on independent schools, obtained from a survey carried out in November 2021-January 2022.

### 7.1 Schools with and without sixth forms

This section looks at schools with and without sixth forms.<sup>4</sup> The proportion of teachers with degrees in science subjects is shown in table 11.

**Table 11: Proportion of science teachers by degree subject and sixth form provision**

Qualification	N: No sixth form	N: Has sixth form	%: No sixth form	%: Has sixth form
Degree in biology	1331	3867	28	25
Degree in chemistry	601	2409	13	16
Degree in physics	195	1479	4	10
Degree in engineering	120	504	3	3
Degree in sports science	266	627	6	4
Degree in another science subject	754	2172	16	14
No degree in science	1452	4127	31	27

Science teachers in a school with a sixth form were more likely to have a science degree than those in a school without. However, the major difference between schools with a sixth form and those without is the balance between the three main sciences. Schools with a sixth form have a higher proportion of both physics and chemistry teachers than those without. The difference in the proportion of physics teachers is particularly striking; just 4% of science teachers in schools with no sixth form hold a physics degree, compared to 10% in schools with a sixth form.

Levels of experience and retention, for science teachers as well as teachers of selected other subjects, are shown in tables 12 and 13.

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<sup>4</sup> Previous analysis refers to 11-16 and 11-18 schools. While most schools in our analysis without a sixth form fall into the previous category, and most with a sixth form into the latter, we do also include some all-through and middle schools.



**Table 12: Proportion of science teachers by level of recent experience and sixth form provision**

Subject	Level of experience	N: No sixth form	N: Has sixth form	%: No sixth form	%: Has sixth form
All	3 years or more	14567	40825	36	34
All	5 years or more	9038	24838	22	21
Science	3 years or more	2186	6356	32	31
Science	5 years or more	1348	3691	20	18
Maths	3 years or more	2127	5622	31	30
Maths	5 years or more	1273	3175	19	17
English	3 years or more	2382	5832	31	29
English	5 years or more	1268	3164	16	16

**Table 13: Proportion of teachers retained by subject and sixth form provision**

Subject	N: No sixth form	N: Has sixth form	%: No sixth form	%: Has sixth form
All	29857	88893	73	73
Science	4786	14659	71	72
Maths	4880	13346	71	72
English	5490	14292	70	71

Both levels of experience and retention are slightly higher for science teachers in schools with a sixth form. However, this is also the case for teachers of English and maths.

## 7.2 Admissions policy

This section looks at variation by admissions policy; that is, by whether a school is selective or not. The proportion of teachers with degrees in science subjects is shown in table 14.

**Table 14: Proportion of science teachers by degree subject and admissions policy**

Qualification	N: Non-selective	N: Selective	%: Non-selective	%: Selective
Degree in biology	4780	418	26	27
Degree in chemistry	2724	286	15	18
Degree in physics	1423	251	8	16
Degree in engineering	545	79	3	5
Degree in sports science	873	20	5	1
Degree in another science subject	2733	193	15	12
No degree in science	5262	317	29	20

Teachers in selective schools were more likely to have a science degree than those in non-selective schools. They were more likely to have a chemistry and particularly a physics degree, and less likely to have a degree in sports science. The balance between the three main sciences was much better in selective schools, although biology teachers still outweighed teachers of physics and chemistry.

Levels of experience and retention in selective schools are shown in tables 15 and 16.

**Table 15: Proportion of science teachers by level of recent experience and admissions policy**

Subject	Level of experience	N: Non-selective	N: Selective	%: Non-selective	%: Selective
All	3 years or more	51866	3526	34	37
All	5 years or more	31737	2139	21	23
Science	3 years or more	7808	734	31	38
Science	5 years or more	4594	445	18	23
Maths	3 years or more	7244	505	30	38
Maths	5 years or more	4149	299	17	23
English	3 years or more	7840	374	30	31
English	5 years or more	4222	210	16	18

**Table 16: Proportion of teachers retained by subject and admissions policy**

Subject	N: Non-selective	N: Selective	%: Non-selective	%: Selective
All	111362	7388	73	78
Science	17954	1491	71	77
Maths	17186	1040	71	79
English	18882	900	71	75

Levels of both experience and retention are higher in selective than non-selective schools. This is true for the overall teaching population and for teachers of science, maths and English, but appears to be particularly the case for teachers of science and maths.

## 7.3 School gender

This section looks at variation by gender; that is, whether schools are boys', girls' or mixed. The proportion of teachers with degrees in science subjects is shown in table 17.

**Table 17: Proportion of science teachers by degree subject and school gender**

Qualification	N: Boys	N: Girls	N: Mixed	%: Boys	%: Girls	%: Mixed
Degree in biology	291	450	4457	24	27	26
Degree in chemistry	205	316	2489	17	19	15
Degree in physics	150	193	1331	13	11	8
Degree in engineering	59	56	509	5	3	3
Degree in sports science	43	31	819	4	2	5
Degree in another science subject	154	221	2551	13	13	15
No degree in science	286	417	4876	24	25	29

Teachers in both girls' and boys' schools are more likely to hold a science degree than those in mixed schools. The balance between teachers holding degrees in the three main sciences is also better in single sex schools, with higher proportions of chemistry and physics teachers than in mixed schools. However, while in boys' schools there is also a slightly lower proportion of biology teachers than in mixed schools, in girls' schools the proportion is slightly higher.

The tables below show the levels of experience and retention in single sex and mixed schools.

**Table 18: Proportion of science teachers by level of recent experience and school gender**

Subject	Level of experience	N: Boys	N: Girls	N: Mixed	%: Boys	%: Girls	%: Mixed
All	3 years or more	3135	4386	47871	38	35	34
All	5 years or more	1948	2722	29206	24	22	21
Science	3 years or more	545	763	7234	36	35	31
Science	5 years or more	320	481	4238	21	22	18
Maths	3 years or more	481	646	6622	37	35	30
Maths	5 years or more	282	418	3748	22	22	17
English	3 years or more	398	603	7213	33	32	29
English	5 years or more	232	345	3855	19	18	16

**Table 19: Proportion of teachers retained by subject and school gender**

Subject	N: Boys	N: Girls	N: Mixed	%: Boys	%: Girls	%: Mixed
All	6106	9305	103339	74	75	73
Science	1130	1578	16737	74	73	71
Maths	955	1372	15899	74	73	71
English	828	1397	17557	69	74	71

Levels of experience and retention are both higher in single sex schools than in mixed schools, particularly in boys' schools. Levels of experience and retention in boys' and girls' schools are very similar for maths and science teachers, although girls' schools have higher levels of retention for English teachers than boys' schools.

## 7.4 Curriculum

In this section, we look at difference between schools by the proportion of pupils who entered a triple science GCSE. Schools are split into four categories: those in which up to 15% entered a triple science GCSE, those in which 15-25%, those in which 25-35% did, and those in which more than 35% entered.

The proportion of teachers with degrees in science subjects is shown in table 20.

**Table 20: Proportion of science teachers by degree subject and availability of triple science**

Qualification	N: Up	N: 15 - 25%	N: 25 - 35%	N: 35% or more	to	%: 15 - 25%	%: 25 - 35%	%: 35% or more
	15%				15%			
Degree in biology	1478	990	1502	1164	27	25	26	26
Degree in chemistry	946	583	772	666	17	15	14	15
Degree in physics	625	257	418	351	11	7	7	8
Degree in engineering	206	103	146	159	4	3	3	4
Degree in sports science	153	232	301	197	3	6	5	4
Degree in another science subject	786	588	861	656	14	15	15	15
No degree in science	1378	1160	1669	1303	25	30	29	29

Science teachers in those schools with a higher proportion of triple science entries were more likely to have a degree in a science subject, particularly physics. They had somewhat better balance between the three main sciences as a result.

The levels of experience and retention by availability of triple science are shown in tables 21 and 22.

**Table 21: Proportion of science teachers by level of recent experience and availability of triple science**

Subject	Level of experience	N: Up to 15%	N: 15 - 25%	N: 25 - 35%	N: 35% or more	%: Up to 15%	%: 15 - 25%	%: 25 - 35%	%: 35% or more
All	3 years or more	15247	11381	16089	12285	37	33	34	34
All	5 years or more	9345	6907	9962	7428	22	20	21	21
Science	3 years or more	2606	1622	2357	1894	35	29	31	31
Science	5 years or more	1557	954	1379	1112	21	17	18	18
Maths	3 years or more	2197	1598	2205	1695	34	29	29	30
Maths	5 years or more	1269	898	1255	993	20	16	17	18
English	3 years or more	2140	1773	2406	1851	32	28	29	30
English	5 years or more	1179	937	1321	971	18	15	16	16

**Table 22: Proportion of teachers retained by subject and availability of triple science**

Subject	N: Up to 15%	N: 15 - 25%	N: 25 - 35%	N: 35% or more	%: Up to 15%	%: 15 - 25%	%: 25 - 35%	%: 35% or more
All	31751	24091	34892	26714	76	70	73	74
Science	5582	3760	5474	4425	75	68	71	72
Maths	4757	3828	5376	4073	74	68	71	72
English	4953	4351	5866	4420	74	68	71	72

Schools with a higher proportion of pupils entered for triple science tended to have higher levels of experience and retention, although this was the case for maths and English teachers as well as for science teachers.

## 7.5 Independent vs state

This section looks at variation by school type; that is, by whether a school is independent or state-funded. As independent schools are not included in the SWFC, data on these schools was obtained via a survey. See section 3.2 for more information.

The proportion of teachers with degrees in science subjects is shown in table 17.

**Table 17: Proportion of science teachers by degree subject and school type**

Qualification	N: Independent	N: State	%: Independent	%: State
Degree in biology	367	5198	38	26
Degree in chemistry	285	3010	29	15
Degree in physics or engineering	274	2298	28	11
Degree in sports science	30	893	3	4
Degree in another science subject	9	3403	1	17
No degree in science	8	5579	1	27

Teachers in independent schools were far more likely to have a degree in one of the three main sciences than those in state schools; 95% compared to 52% in state schools. The difference was largest in physics and engineering (17 percentage points) but still very large in both chemistry and biology (14 and 12 percentage points).

Independent schools employed fewer teachers with degrees in science subjects outside the main three subjects, and far fewer with no science degree; over a fifth of teachers in state schools had no science degree in 2019, compared to 1% of teachers in independent schools surveyed in 2021/22.

The balance between the three main sciences was also better in independent schools, although teachers with degrees in biology still outweighed those with degrees in chemistry or physics / engineering.

Levels of experience and retention are shown in tables 18 and 19. Unfortunately, a direct comparison between independent and state schools is difficult here. Because of issues with reliability of the SWFC data, we were only able to reliably identify whether teachers' levels of recent experience, as opposed to their overall level of experience. The survey, on the other hand, asked about teachers' overall level of experience. Therefore we might expect the survey data to find higher levels of experience even if there was no actual difference in the levels.

To mitigate this, we also present data on the number of years that teachers had spent in their current school as a proxy for recent experience.



**Table 18: Proportion of science teachers by level of recent experience and school type**

Level of experience	N: Independent	N: State	%: Independent	%: State
3 years or more	896	8913	92	33
5 years or more	804	5246	83	19
3 years or more in current school	780	8542	80	31
5 years or more in current school	594	5039	61	19

Although direct comparisons are difficult to make, it is clear from the table above that science teachers in independent schools tended to have high levels of experience, with the vast majority (92%) having at least three years of teaching experience.

Finally, table 19 shows the proportion of teachers who remained at the same school in which they were teaching in the previous year.

**Table 19: Proportion of teachers retained by subject and school type**

Subject	N: Independent	N: State	%: Independent	%: State
Science	855	89210	88	71

The vast majority of teachers in independent schools (88%) were teaching in the same school in 2021/22 as they were the previous year. This compares to just 71% of teachers in state-funded schools who were teaching in the same school in 2018/19 as in the previous year.

## 8. Conclusions

### 8.1 Discussion

We found that the majority of science teachers (73%) for whom complete data was available had a degree in a science subject, with the most common subject being biology. In line with previous work<sup>5</sup>, we found that the balance between science teachers with degrees in the three main science subjects was poor; 26% had a degree in biology, 15% in chemistry and just 11% in physics or engineering. While we need to be cautious in drawing comparisons with earlier work, our findings do indicate that there has been no marked improvement in the balance between the three main subject specialisms in recent years, at least in terms of teachers with degrees in the relevant subject.

We found that science teachers are less likely to have higher levels of recent teaching experience than the overall population of teachers, and less likely to remain at the same school. However, we also found that the same was true of maths and English teachers, suggesting that this is perhaps characteristic of those teaching compulsory subjects rather than specific to science.

Although we did not find that any one region had markedly better balance in terms of qualifications in the three main sciences, we did find differences in experience and retention. London has the lowest levels of retention, while the North East and North East had the highest. On the whole the levels of experience and retention for science teachers were similar to those for maths and English teachers in every region.

Some types of school enjoy a much better balance between teachers with qualifications in the three main sciences than others. Amongst state-funded schools, selective schools and single sex schools are the most well-balanced, and schools with sixth forms are also much better balanced than those without. Schools with higher proportions of pupils entering triple science are somewhat better balanced than those with lower levels.

We also found that selective schools, single sex schools and those with higher proportions of triple science entries had higher levels of recent experience and retention, but we did not find that this was unique to science teachers.

Finally, although we need to be cautious about comparing results obtained from our survey of independent schools and our analysis of the situation in state schools using the SWFC, we found indications of differences in qualifications, experience and retention. Almost all (95%) of teachers in independent schools held a science degree, compared to 73% of those in state schools for whom data on degree

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<sup>5</sup> *Mathematics and Science in Secondary Schools*, Moor et al (2006), accessed at <https://www.nfer.ac.uk/publications/DMS01/DMS01.pdf>

qualifications was available, and the balance between the three main science subjects was much better in independent schools. However, even in independent schools there were still more science teachers with biology degrees than with degrees in chemistry or physics / engineering. Independent schools also enjoyed higher levels of experience and of retention among science teachers than state schools.

## 8.2 Limitations

The limitations of this analysis are largely due to the sometimes poor quality of the data in the School Workforce Census (SWFC). We have set these out in more detail in section 3.1.

High levels of missing data mean that we have been forced to exclude some schools and teachers entirely from our analysis. Others have been included in some sections but not others. Most notably, the qualifications section excludes any teachers for whom we do not have complete data on any qualification. Also, in some cases schools did not complete the census every year, meaning that calculating historic information such as experience or retention was challenging.

This report draws comparisons between information obtained from analysis of the SWFC and survey data. While efforts have been made to make the analysis as comparable as possible, some differences in the findings may be due to the differing methodologies. It is also important to note that the survey attracted more responses from schools with sixth forms and larger schools. This may have led to some bias in the results; as shown elsewhere in the report, state schools with sixth forms do tend to have more science teachers with degrees in the three main sciences, higher levels of experience and retention.

Finally, as part of our analysis of the SWFC, we have been forced to define exactly which degrees do and do not count as, for example, a degree in biology. Some of these definitions may be open to debate; we include the full list of degree subjects and our corresponding subject definitions as an appendix.

## 9 Appendix: JACS codes

In this report, we have defined degree subject according to JACS code.

The classifications that we use are in line with those used in previous work<sup>6</sup>, but may nevertheless be open to debate. We include them in the attached Excel workbook.

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<sup>6</sup> *Improving Science Teacher Retention*, Allen and Sims (2017), accessed at <https://wellcome.org/sites/default/files/science-teacher-retention.pdf>