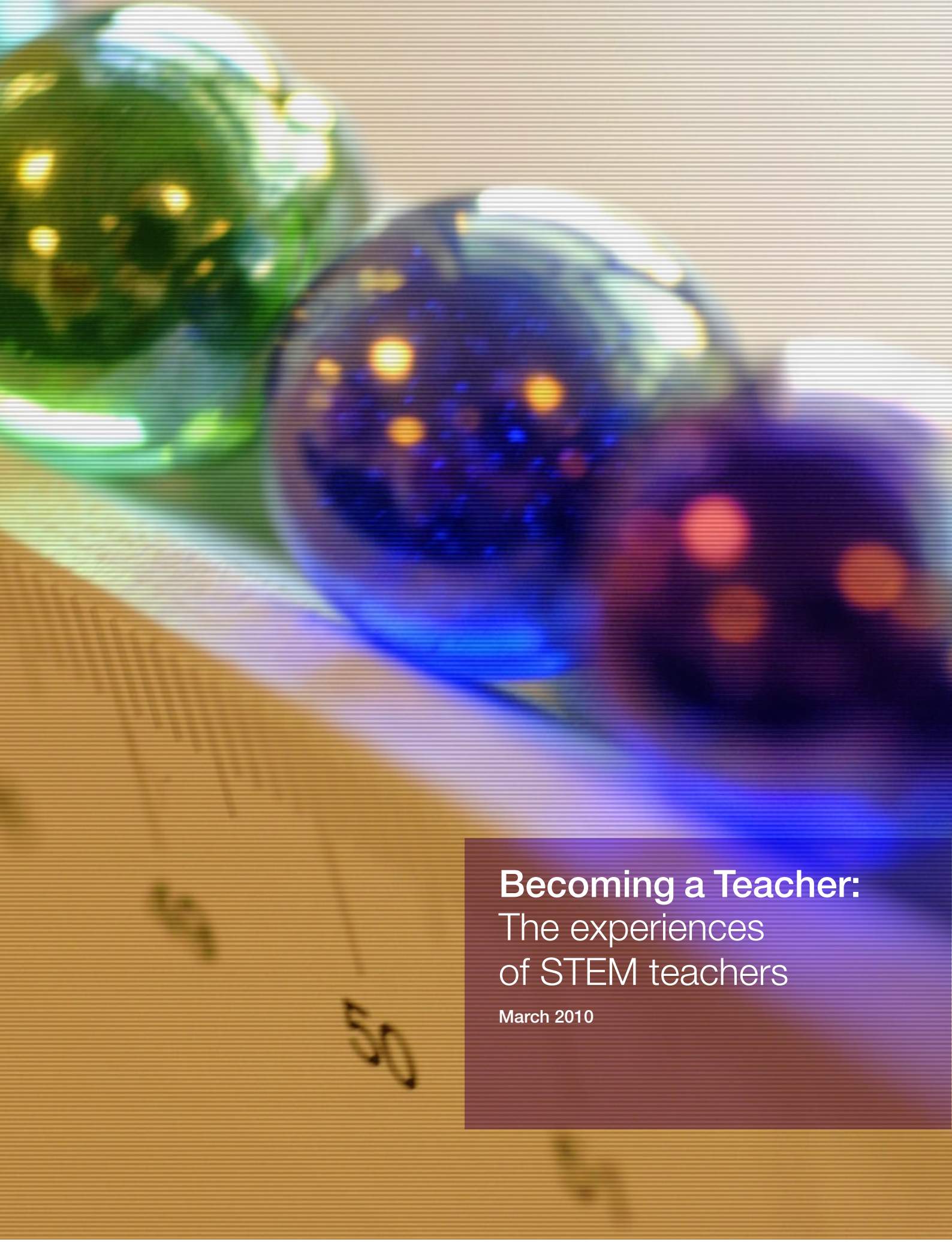

# Becoming a Teacher:
## The experiences of STEM teachers

March 2010

Ipsos MORI
Social Research Institute

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**Published by the Wellcome Trust, 2010.**

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## Acknowledgements

The authors would like to acknowledge the contributions of Andy Hobson (BaT Co-ordinating Director, University of Nottingham), Ianthe Wright, James Rushbrooke and Sarah Baker (DCSF) and Dr. Simon Gallacher, Hannah Russell and Derek Bell (the Wellcome Trust) to developing this report.

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Joanne Crouch
Ipsos MORI Social Research Institute, March 2010

# Executive summary

# Executive summary

The Department for Children, Schools and Families (DCSF) and the Wellcome Trust commissioned Ipsos MORI to conduct a survey to investigate the attitudes and experiences of "STEM" (Science, Technology, Engineering and Mathematics) teachers compared with their "non-STEM" colleagues. There has been a long-standing difficulty in recruiting and retaining sufficient mathematics and science teachers and it was hoped that this study would identify any areas or specific factors that warrant more detailed and robust follow-up investigation.

A number of questions were included in the final wave of the six-year *Becoming a Teacher* (BaT)[1] survey to ask about the subjects that teachers previously studied, qualified to teach through Initial Teacher Training (ITT), and the subjects they currently teach and specialise in. The BaT study was conducted to explore beginner teachers' experiences of ITT, Induction and early professional development. As such it formed an ideal platform from which to investigate the experiences and attitudes of "STEM" and "non-STEM" teachers in their early careers. However, since the BaT survey was not originally designed to be representative of trainee teachers by subject specialism, results should be regarded as indicative only and should not be generalised to the whole population of trainee teachers.

In total, 1,443 respondents completed the BaT Wave 6 telephone survey between June and July 2008. The sample consists of 638 secondary and 745 primary teachers[2]. Due to the generalist nature of primary teaching, primary and secondary teachers' experiences are reported separately. Key findings are outlined below:

**Subjects taught and subject specialisms**

- Currently, one in seven (15%) secondary teachers teach a science subject, one in six (17%) teach mathematics and a quarter (24%) teach another "STEM" subject. This compares with one in eight who say they specialise in science (13%) and in mathematics (12%), and one in six who say they specialise in another "STEM" subject.

- Similar proportions of secondary teachers currently teach as were qualified to teach each subject at ITT. Furthermore, similar proportions currently specialise in each subject as studied the subject at undergraduate or post-graduate degree level. This appears to be the case particularly for mathematics as slightly fewer teachers

[1] BaT was a six-year longitudinal study (2003-2009) commissioned by DCSF, TDA and GTC.

currently teach science than qualified to teach science (15% and 19%), and slightly fewer specialise in science than studied science at degree level (13% and 17%).

- Currently one in four primary teachers teach a science subject (25%) and four in five teach mathematics (81%) or another "STEM" subject (79%). This is much higher than the proportion of secondary teachers who teach these subjects due to the generalist nature of primary education. Primary teachers are less likely to classify themselves as a specialist, however: one in ten (10%) say they currently specialise in science, one in six (16%) specialise in mathematics and one in five (20%) specialise in another "STEM" subject.

- Unlike secondary teachers, more primary teachers are currently teaching science (75%) mathematics (81%) and other "STEM" subjects (79%) than qualified to teach these subjects at ITT (62%, 68% and 67% respectively). However, a similar proportion currently specialise in these subjects as studied them at undergraduate or post-graduate level (15%, 14% and 19% respectively).

**Secondary teachers' career paths**[3]

- There are some secondary teachers who no longer consider themselves a specialist in the subject they studied. Of those who studied science at undergraduate or post-graduate degree level, seven in ten (69%) say they currently specialise in science and similarly, of those who studied mathematics, 70% currently specialise in the subject. A much smaller proportion of secondary teachers who studied another "STEM" subject currently specialise in another "STEM" subject (47%).

- There are a small number of specialists who did not originally study their 'specialist' subject at undergraduate or post-graduate degree level. Of those who say they currently specialise in science, 90% studied science at degree level; of those who say they specialise in mathematics, 69% studied the subject at degree level; and of those who specialise in another "STEM" subject, 72% studied another "STEM" subject.

- Teachers who specialise in a subject that they did not previously study at degree level have most commonly developed their specialism by *'self-teaching (I've picked it up as I've gone along)'* and through *'CPD/inset from a specialist provider'*.

[2] There are 60 respondents who cannot be categorised as either primary or secondary due to missing or contradictory information.
[3] It is less meaningful to review the career paths of primary teachers as both their training and teaching tend to be more general i.e. across the whole curriculum rather than specific subjects.

- The most frequently identified reason for specialising in a subject that was not studied at degree level is *'personal interest in the subject'.*

**Intentions to remain in teaching**

- Science and mathematics specialists are slightly more likely than their colleagues to currently be in a teaching post (100% of secondary and 98% of primary science and mathematics specialists compared with 94% and 92% of other subject specialists).

- Amongst secondary and primary teachers, there are no differences between specialists in terms of their intentions to remain in teaching, nor are there any apparent differences in reasons for leaving teaching or factors motivating teachers to continue in their career.

**Career development**

- Among secondary teachers, specialists in science and mathematics are less likely to be Head of Department or Subject/Curriculum Co-ordinator – for example, 12% of mathematics specialists and 15% of science specialists were Head of Department compared with 30% of other subject specialists. Among primary teachers, however, there is no difference in the likelihood of being Head of Department/Subject or Curriculum Co-ordinator but primary mathematics specialists are more likely than other subject specialists to be Head of Year (19% compared with 10%)[4].

- Secondary teachers specialising in science or mathematics are less likely to have been involved in extra-curricular activities (both 84%) compared with other subject specialists (91%) and mathematics specialists are less likely to have taken pupils on school trips (64% compared with 81%). These differences are not apparent among primary specialists, however.

- On the whole, the career aspirations of secondary science and mathematics specialists are on a par with those specialising in other subjects. However, primary teachers who specialise in mathematics are more likely to be seeking promotion to Deputy Head (35%) or Headteacher (11%) than their colleagues (18% and 4% of primary teachers specialising in other subjects).

[4] Please note that these job titles were self-reported by respondents.

**Attitudes towards teaching**

- Science and mathematics specialists at secondary level tend to be slightly less positive in their attitudes towards teaching than those who specialise in other subjects, being more likely to rate themselves as a fairly effective teacher (56% and 53% compared with 39%) rather than a very effective teacher. Secondary mathematics specialists are also less likely than other subject specialists to strongly agree that they enjoy working as a teacher (58% compared with 70%).

- In contrast to secondary teachers, however, primary specialists in science and mathematics are more likely to rate themselves as a very effective teacher (65% and 61% compared with 52%) and strongly agree that they enjoy working as a teacher (72% and 74% compared with 65%).

**Teaching and CPD experiences**

- Mathematics specialists work on average one hour less per week than both science and other subject specialists. Primary science and mathematics specialists work on average four hours less than other subject specialists.

- There are no apparent differences between either primary or secondary specialists in other teaching experiences including amount of non-contact time, ratings of support received, undertaking CPD and focus of CPD.

**Training bursaries and golden hellos**

- Just over four in five (82%) teachers who were eligible to receive a training bursary did so and just over two in five (41%) who were eligible to receive a golden hello did so.

- Over half of those who did receive a training bursary or golden hello said it did not influence their decision to specialise in a particular subject (each 51%) and just under half of those who received a golden hello said it did not influence their decision to continue with teaching (49%).

# Introduction

# 1. Introduction

This report presents the findings from additional analysis of the *Becoming a Teacher* datasets, undertaken by Ipsos MORI on behalf of the Department for Children, Schools and Families (DCSF) and the Wellcome Trust.

The *Becoming a Teacher* (BaT) study is a six-year longitudinal research project (2003-2009) exploring beginner teachers' experiences of initial teacher training (ITT), Induction and early professional development (EPD) in England. A key objective of this research was to examine the extent to which the experiences of people entering the teaching profession via different ITT pathways may vary[5], and the extent to which such experiences might also be shaped by other factors, including teachers' prior conceptions and expectations of teaching and teacher training. The BaT project was funded by the DCSF, the General Teaching Council for England (GTC) and the Training and Development Agency for Schools (TDA). A series of publications relating to this research is available from the DCSF[6].

The BaT project's quantitative component was completed over six waves. Wave 1 was undertaken in 2003, using a paper, self-completion questionnaire, as student teachers commenced the "final" year of initial teacher training[7]. Wave 2 was undertaken in 2004, using a telephone survey administered to as many as possible of the initial Wave 1 cohort, as student teachers completed their "final" year of initial teacher training. Follow-up telephone surveys with the same cohort were then undertaken annually in 2005 (Wave 3, as NQTs completed their first year in post), 2006 (Wave 4, NQT+1), 2007 (Wave 5, NQT+2) and 2008 (Wave 6, NQT+3 – the final year of the study).

As part of the Wave 6 survey, DCSF and the Wellcome Trust commissioned the inclusion of a set of 14 questions[8] with a specific focus on teachers of "STEM" subjects (Science, Technology, Engineering and Mathematics)[9]. In part, the inclusion of these questions was to gather additional demographic information about teachers who were still part of the BaT sample, in order to facilitate retrospective analysis on the ITT, Induction and EPD experiences of teachers who define themselves as specialists in a "STEM" subject compared to those of their colleagues who, variously, are:

- qualified to teach "STEM" subjects but do not define themselves as "STEM" specialists; or
- teachers of "STEM" subjects who neither define themselves as "STEM" specialists nor are qualified to teach it; or
- "non-STEM" teachers.

Their inclusion also allowed the collation of additional attitudinal evidence about teachers of "STEM" subjects.

The following chapter sets out the composition of each of these sub-groups in more detail.

[5] Specifically, the university-administered Post-Graduate Certificate in Education (PGCE); the Flexible PGCE; the Bachelor of Education (BEd); the Bachelor of Arts/Science with Qualified Teacher Status (BA/BSc QTS); School-Centred Initial Teacher Training (SCITT programmes); and the Graduate and Registered Teacher Programmes (GRTP).
[6] http://www.dcsf.gov.uk/rsgateway/index.shtml
[7] That is, as they began one-year ITT programmes, or were beginning the final year of two-, three- or four-year programmes.
[8] The questions, marked up with aggregate Wave 6 survey findings, may be found in the appendices.
[9] There has been a long-standing difficulty recruiting enough mathematics and science trainee teachers to meet the numbers requested by DCSF of the TDA. It was suggested that the BaT sample might provide some useful information, not only about motivations for recruitment and any route-specific differences, but also about retention and motivations in the early years of teaching.

## The focus for the analysis

The Waves 1-6 BaT datasets were re-analysed for both primary and secondary practitioners to explore (specifically from a "STEM" perspective):

- The experiences, attitudes and aspirations of science specialists and mathematics specialists versus other teachers.
- The *changing* experiences, attitudes and aspirations of science specialists and mathematics specialists versus other teachers (e.g. have specialisms changed over time, what did "STEM" 'specialists' do previously, how many have become multiple specialists etc.).
- Factors influencing the retention of science specialists and mathematics specialists versus other teachers (workload, career progression, CPD opportunities, support received, incentivisation etc.).

For reasons of clarity, the reporting which follows reflects only those differences in the findings found to be statistically significant (see below). Therefore, the absence of reporting on – say – retention factors comparing science and mathematics specialists by training route should not be regarded as an oversight; instead, it indicates that the report authors found nothing meaningful to flag up. It is also worth noting that sub-group base sizes might be too small (30 respondents or fewer) to undertake valid comparative analyses and – again – these have not been described.

## Interpreting the data

It should be carefully noted that the Wave 1 BaT dataset comprised a sample of trainee teachers stratified to be representative of initial teacher trainees by training route. The original sample was **not** designed to be representative of trainees by subject specialism and so the findings reported here in relation to "STEM" teachers are reflective only of respondents within the Wave 6 sample: they cannot be generalised to the total population of trainee teachers, nor to sub-groups within the total population of trainee teachers (e.g. "STEM" specialists within the achieved sample are unlikely to be representative of the universe of "STEM" specialists who completed their ITT in 2004). Thus, differences in response described in this report as 'significant' should be regarded as **indicative only**.

Similarly, from a "STEM" perspective, the BaT datasets were not always as detailed or complete as would be necessary to undertake the analysis reported here with greater confidence. In short, the authors have needed to make a number of assumptions in order to fill gaps in the datasets, as well as to report findings more cautiously than might otherwise be the case.

The rationale for the report's commission was to provide a springboard for the work, going forward, of policy-makers and key stakeholders in the identification of factors that might warrant a more detailed, and (importantly) a methodologically robust, follow-up. To this extent, commentary on the findings is limited; expert readers should be better placed to gauge the weight to attribute to the findings and to determine the implications and actions arising from what the data seem to indicate.

# Glossary of definitions used in this report

# 2. Glossary of definitions used in this report

Quantitative research on the *Becoming a Teacher* survey has been conducted over six waves as follows:

- Wave 1, in 2003, as student teachers commenced the "final" year of initial teacher training[10]
- Wave 2, in 2004, as student teachers completed their "final" year of initial teacher training
- Wave 3, in 2005, as NQTs completed their first year in post
- Wave 4, in 2006, as respondents completed their second year in post ("NQT+1")
- Wave 5, in 2007, as respondents completed their third year in post ("NQT+2")
- Wave 6, in 2008, as respondents completed their fourth year in post ("NQT+3")

During Wave 6, in order to inform the analysis reported here, the opportunity was taken to firm-up on information gathered in earlier waves of the survey relating to subjects studied by respondents at undergraduate or post-graduate level, subjects that these respondents were qualified to teach through their initial teacher training programme, subjects they teach now and subjects they regard as a specialism. **Please note that what constitutes a "specialism" (other than studying a subject at undergraduate or post-graduate level) was self-defined by respondents.**

As a result, there are four subject-related variables in the Wave 6 dataset which are used in this analysis. These are:

- subjects studied at undergraduate or post-graduate level*;*
- subjects qualified to teach on completion of ITT*;*
- subjects currently taught*;* and
- current subject specialism (as defined by the respondent)*.*

Throughout this report, reference is made to teachers who studied, are qualified to teach, currently teach and currently specialise in (as per the above definitions) "STEM" and "non-STEM" subjects. These are categorised in the following ways:

**Science** – any core science subject including biology, chemistry, physics and combined, general or balanced science. This includes pure scientists (those who only studied/qualified/ teach/specialise in science) as well those who studied/qualified/teach/specialise in other subjects alongside science. For this reason, a small number of teachers are included in more than one category.

**Mathematics** – mathematics. This includes pure mathematicians (those who studied/ qualified/teach/specialise in mathematics only) and those who studied/qualified/teach/ specialise in other subjects alongside mathematics. For this reason, a small number of teachers are included in more than one category.

**Other "STEM" subjects** – any subjects other than science and mathematics which fall under the "STEM" title including: engineering, ICT and design & technology and 'any other

[10] That is, as they began one-year ITT programmes, or were beginning the final year of two-, three- or four-year programmes.

science'. This includes pure STEMists (those who only studied/qualified/teach/specialise in other "STEM" subjects) as well those who studied/qualified/teach/specialise in other subjects, including science and mathematics, alongside other "STEM" subjects. For this reason, a small number of teachers are included in more than one category.

In later chapters, where we look in more detail at the attitudes and experiences of teachers, the first two groups – science specialists and mathematics specialists – are taken as the focus. Other "STEM" specialists are not commented on because small base sizes and the overlap with science and mathematics categories mean there are few meaningful differences. As such, science and mathematics specialists (as per the above definitions) are compared with those who do not specialise in science or mathematics.

Before Wave 6 fieldwork, we hypothesised that teachers of subjects which, arguably, are closely related to "STEM" subjects – such as business studies and economics – might be specialism 'migrants' from mathematics. Therefore, in the initial analysis, these were treated as "pseudo-STEM" subjects so that the more precise Wave 6 questioning would allow us to assess, if any, their 'migration' from "STEM".

# Analysis by subject specialism

# 3. Analysis by subject specialism

This chapter explores the extent to which the subject specialisms of science and mathematics teachers in the BaT sample have changed in the four years since completion of initial teacher training (ITT). The following questions are explored:

- Have those who studied a "STEM" subject at undergraduate or post-graduate level tended to remain "STEM" specialists after four years of teaching?
- Did current "STEM" specialists come from a "STEM" background in terms of previous study and ITT qualification?
- What proportion of "STEM" subject specialists change to, or take on additional specialisms in, other "STEM" subjects?

There are four subject-related variables in the *Becoming a Teacher* datasets which were asked at Wave 6 and then used in this analysis to explore these questions:

- "STEM" subjects studied at undergraduate or post-graduate level;
- "STEM" subjects qualified to teach on completion of ITT;
- "STEM" subjects taught currently; and
- Current "STEM" subject specialism.

All four of these measures were used only in Wave 6. Prior to this, the BaT survey provided only limited data about subjects taught by respondents, and certainly not enough to accurately track change in specialisms over time. For this reason, the analysis in this chapter is based on the 1,443 respondents to the Wave 6 survey.

Secondary teachers differ from primary teachers in that they tend to teach (and be trained to teach) a specific subject or subjects rather than a broad range of subjects. For this reason secondary and primary teachers have been analysed and reported on separately.

# Secondary teachers

## Profile of science, mathematics and other subject specialists

Table 3.1 below summarises the proportion of secondary teachers in the Wave 6 cohort who studied, were qualified to teach, currently teach and currently specialise in science, mathematics and other subjects.

**Table 3.1: Profile of secondary teachers in the Wave 6 sample**

| Profile<br><br>*Base: 681 secondary teachers* | Studied at undergraduate or post-graduate level<br><br>% | Qualified to teach by ITT<br><br>% | Currently teach<br><br>% | Specialise in<br><br>% |
|---|---|---|---|---|
| **Science** | | | | |
| All science | 17 | 19 | 15 | 13 |
| Only science | 10 | 12 | 11 | 12 |
| **Mathematics** | | | | |
| All mathematics | 12 | 17 | 17 | 12 |
| Only mathematics | 5 | 10 | 11 | 11 |
| **Other "STEM" subjects** | | | | |
| All other "STEM" subject(s) | 25 | 27 | 24 | 16 |
| Only other "STEM" subject(s) | 18 | 19 | 18 | 15 |
| **No "STEM" subject(s)** | | | | |
| No "STEM" subject(s) | 57 | 50 | 12 | 9 |

Around one in six secondary teachers in the sample are currently teaching science (15%) or mathematics (17%); almost a quarter (24%) currently teach another "STEM" subject. Of those who teach each of these "STEM" subjects, most teach that subject alone rather than in conjunction with other subjects.

As might be expected, four years on, most secondary teachers continue to teach the subject they were qualified to teach by their ITT. Seventeen percent of secondary teachers in the wave 6 cohort say that their ITT qualified them to teach mathematics and the same proportion say they teach this subject currently. There is a difference, however, in relation to science, although small: slightly fewer secondary teachers currently teach science (15%) than were qualified to do so by their ITT (19%).

In terms of subject specialisms, the proportion of secondary teachers in the Wave 6 cohort who regard themselves as science or mathematics specialists is broadly the same: 13% for science compared with 12% for mathematics. Slightly more regard themselves as a specialist in another "STEM" subject (16%). In the case of mathematics, the proportion of current specialists is in line with the proportion that studied this subject at undergraduate or post-graduate level (both 12%), although marginally more studied a science subject at degree level than currently specialise in this (17% vs. 13%).

These headline results give some sense of the change (or lack of it) in teachers' subject specialisms between ITT and the end of their fourth year in post. However, overall figures such as these can mask the full extent of change. For example, if the proportion of science specialists who become mathematics specialists is broadly the same as mathematics specialists who become science specialists, then there would appear to be no change at the overall level.

Therefore, in order to fully understand the extent of changes in subject specialism, the following sections examine the career paths of two groups in more detail:

- Those who studied science, mathematics or another "STEM" subject at undergraduate or post-graduate level; and
- Current science, mathematics, or other "STEM" subject specialists.

## Career paths of those with a subject specialism at undergraduate or post-graduate study

Table 3.2 below summarises the career paths of those secondary teachers who studied "STEM" subjects at undergraduate or postgraduate level, indicating what proportion of this group are teaching or specialising in those subjects four years after completing their ITT. Around seven in ten secondary teachers who studied science or mathematics at degree level now regard themselves as specialists in these subjects (69% and 70% respectively), while marginally more currently teach them (70% and 77% respectively). This highlights that around three in ten secondary teachers are no longer teaching or specialising in science or mathematics, despite studying these subjects to degree level previously.

**Table 3.2: Career paths of secondary teachers who studied science, mathematics or another "STEM" subject at undergraduate or post-graduate level**

| Profile | All who studied science *(115)* % | All who studied mathematics *(84)* % | All who studied another "STEM" subject *(171)* % |
|---|---|---|---|
| **Currently teach:** | | | |
| Science | **70** | 20 | 18 |
| Mathematics | 16 | **77** | 22 |
| Another "STEM" subject | 18 | 21 | **56** |
| **Specialise in:** | | | |
| Science | **69** | 17 | 16 |
| Mathematics | 11 | **70** | 19 |
| Another "STEM" subject | 6 | 8 | **47** |

Turning to teachers of other "STEM" subjects, the gap between current specialisms and subjects taught widens. Fewer than half (47%) of all secondary teachers who studied another "STEM" subject regard themselves as subject specialists in this area, although almost six in ten (56%) teach these subjects, indicating that specialists in these subjects are particularly likely to teach "non-STEM".

## Previous career paths of current subject specialists

This section reviews the background of current science and mathematics specialists to investigate whether those who say they currently specialise in a "STEM" subject originally studied or were qualified to teach that subject.

Table 3.3 below shows the proportion of secondary teachers who currently specialise in science, mathematics or another "STEM" subject who studied this subject at undergraduate or post-graduate level, as well as the proportion of teachers who were qualified to teach this subject by their ITT.

**Table 3.3: Past subject specialisms of secondary teachers who currently specialise in science, mathematics or another "STEM" subject**

| Profile | All who specialise in science *(88)* % | All who specialise in mathematics *(85)* % | All who specialise in another "STEM" subject *(111)* % |
|---|---|---|---|
| **Studied at undergraduate or post-graduate level:** | | | |
| Science | **90** | 15 | 6 |
| Mathematics | 16 | **69** | 6 |
| Another "STEM" subject | 31 | 39 | **72** |
| **Qualified to teach by ITT:** | | | |
| Science | **100** | 11 | 10 |
| Mathematics | 14 | **92** | 12 |
| Another "STEM" subject | 22 | 24 | **91** |

As we might expect, the vast majority of current science specialists teaching in secondary schools previously studied science, normally as a single science discipline, at undergraduate or post-graduate level; nine in ten science specialists (90%) have done so while 100% say their ITT qualified them to teach this subject.

Fewer mathematics specialists studied their subject to degree level; seven in ten (69%) did so, although 92% say that their ITT qualified them to teach mathematics. A similar proportion (72%) of other "STEM" subject specialists had previously studied at least one "STEM" subject as part of their undergraduate or post-graduate studies and 91% were qualified to teach another "STEM" subject. It is worth noting here that these are all self-reported measures. Some teachers may incorrectly believe that their ITT did not qualify them to teach a particular subject when it in fact did, or vice versa. For this reason, this evidence of teachers specialising in a subject they were not qualified to teach should be treated with a degree of caution.

## Individual subject changes

So far, this chapter has focused on movement between three groups: science specialists, mathematics specialists and other "STEM" subject specialists. The following section examines individual subject changes in more detail.

The following table (3.4) shows the proportion of teachers who studied a particular "STEM" subject at undergraduate or post-graduate level, and compares them with the proportion who are currently specialising in or teaching that subject four years after completing their ITT.

Fewer secondary teachers currently specialise in each subject than previously studied each of them. The exception to this is mathematics, which 13% of secondary teachers currently specialise in compared with 12% who studied it at undergraduate or post-graduate degree level.

Significantly more secondary teachers in the Wave 6 cohort now teach physics, combined science, mathematics or ICT than previously studied these subjects to degree level. The reverse is true for engineering, with fewer teachers currently teaching this than studied it as part of their degree, probably because this is a minority subject which may not be offered in all secondary schools.

**Table 3.4: Changes in individual subject specialisms and subjects taught among secondary teachers**

| **Subject**<br><br>*Base: 681* | **Studied at undergraduate or post-graduate level (incl. ITT)**<br>**%** | **Current specialist**<br>**%** | **Currently teaching**<br>**%** |
|---|---|---|---|
| Biology | 11 | 6 | 11 |
| Chemistry | 8 | 5 | 10 |
| Physics | 7 | 3 | 10 |
| Combined, balanced or general science | 5 | 3 | 12 |
| Another science (excluding engineering) | 1 | 1 | 2 |
| Maths | 12 | 13 | 17 |
| Design & Technology | 7 | 6 | 9 |
| Information & Communications Technology (ICT) | 12 | 9 | 16 |
| Engineering | 6 | - | 1 |

## Changing specialisms in science

This section explores the extent to which science specialists change or take on additional specialisms in other science subjects by examining the career paths of those secondary teachers who studied any science subject at undergraduate or post-graduate level. Table 3.5 outlines the specific subjects studied, the subjects currently taught and subjects currently specialised in by secondary teachers who studied a science to degree level.

Of those secondary teachers who have ever studied a science subject to degree level, more studied a single subject science than general science; just three in ten of this group studied combined science (31%), compared with 69% who studied one or more single subject science. Biology was the subject most widely studied; 63% of those who studied any science subject to degree level studied this, compared with 49% and 38% of the same cohort who have studied chemistry and physics respectively.

**Table 3.5: Changes in science subject specialisms among secondary teachers**

| **Subject**<br><br>*Base: 115* | **Studied at undergraduate or post-graduate level**<br>**%** | **Currently teach**<br><br>**%** | **Current specialist**<br><br>**%** |
|---|---|---|---|
| Biology | 63 | 55 | 32 |
| Chemistry | 49 | 51 | 23 |
| Physics | 38 | 51 | 17 |
| Combined, balanced or general science | 31 | 52 | 17 |

Four years after completion of their ITT, the vast majority of secondary teachers who studied a science subject to degree level still teach one or more single science subject (55% biology, 51% chemistry, 51% physics and 52% combined, balanced or general science), and in terms of chemistry, physics and combined science, more currently teach these than studied them at degree level. Many of those who studied a science subject to degree level also currently specialise in a science subject (32% biology, 23% chemistry, 17% physics; compared with 17% combined science).

## Reasons for changing subject specialism

Amongst those beginner teachers who regard a particular subject as a specialism but did not study the subject concerned at either undergraduate or post-graduate level, the most frequently identified reason for specialising in a "STEM" subject is *personal interest in the subject* (see table 3.6). Over half of secondary teachers who now regard themselves as subject specialists in science, mathematics or another "STEM" subject give this as a contributory factor. It is worth noting that none of the respondents said they were motivated to specialise by the availability of training bursaries or 'golden hellos' but two new specialists in another "STEM" subject did report that additional pay or incentives provided by the school was a factor in their decision.

**Table 3.6: Reasons for changing subject specialisms among secondary teachers**

| | **Science** *(29)* **n** | **Mathematics** *(26)* **n** | **Another "STEM" subject** *(41)* **n** |
|---|---|---|---|
| Personal interest in the subject | 18 | 16 | 23 |
| Increased opportunities for career progression | 3 | 5 | 8 |
| Started to teach it as a non-specialist and found I enjoyed it | 3 | 3 | 1 |
| Need to teach it as part of my role | 4 | - | 2 |
| Prior experience/background knowledge | - | 2 | 5 |
| No-one else with this specialism in the school | 2 | 2 | 1 |
| Part of my degree/A-level/other qualification | 1 | 1 | 2 |
| For the benefit of the school/pupils | - | 1 | 2 |
| Additional pay or incentives provided by the school | - | - | 2 |
| Other | 1 | - | 3 |
| Don't know/No answer | 1 | - | 1 |

## Steps taken to develop new subject specialisms

Amongst secondary teachers who regard a particular subject as a specialism but did not study the subject concerned at either undergraduate or post-graduate level, the most frequently identified means of specialisation is *self-taught (I've picked it up as I've gone along)*. However, a significant proportion also says they have specialised via *CPD/INSET provided by a specialist provider*, or via *peer-led CPD/INSET* (see table 3.7). Only a few of those developing new subject specialisms in mathematics or science appear to have done so via CPD/INSET provided by the National Centre for Excellence in Mathematics (NCETM) (one mathematics specialist) or the National Science Learning Centre (NSLC) (two science specialists)[11].

**Table 3.7: Steps taken to develop subject specialisms among secondary teachers**

| | **Science** *(29)* **n** | **Mathematics** *(26)* **n** | **Another "STEM" subject** *(41)* **n** |
|---|---|---|---|
| Self taught (picked it up as I've gone along) | 10 | 13 | 15 |
| CPD/inset from a specialist provider | 6 | 9 | 17 |
| Peer led CPD/inset | 3 | 5 | 10 |
| CPD/inset through 'National Strategies' | 3 | - | 5 |
| CPD/inset from a Local Science Learning Centre | 3 | 1 | 2 |
| CPD/inset from NSLC/NECTM | 2 | 1 | 3 |
| Post-ITT degree | 2 | 1 | 1 |
| Working closely to colleagues | 1 | - | 1 |
| None | 2 | 1 | 3 |
| Other | 1 | 3 | 3 |
| Don't know | 1 | 2 | 3 |

[11] Please note that this is not to say that teachers who already considered themselves to have a specialism have not undertaken CPD via the NCETM or NSLC.

# Primary teachers

Broadly the same patterns follow with primary teachers as already seen with secondary teachers. Where there are differences, these are likely to be due, at least in part, to the fact that primary teachers tend to be generalists; that is, primary teachers tend to teach a broad range of subjects rather than focusing on a single subject area. Training for primary teachers therefore is also more generalist than that for secondary teaching.

There also seems to have been greater variation in interpretation regarding what subjects their ITT qualified them to teach, particularly as a large proportion of primary teachers completed PGCEs. It seems that some primary teachers assumed that their ITT qualified them to teach all core subjects, including science and mathematics, while others cite no specific subjects perhaps because they viewed their ITT as qualifying them to teach across the whole primary curriculum.

## Profile of science, mathematics and other subject specialists

Table 3.8 below summarises the proportion of science, mathematics and other teachers in the Wave 6 cohort at various stages during their early careers.

**Table 3.8: Profile of primary teachers in the Wave 6 sample**

| **Profile**<br><br>*Base: 757 primary teachers* | **Studied at undergraduate or post-graduate level**<br><br>**%** | **Qualified to teach by ITT**<br><br>**%** | **Currently teach**<br><br>**%** | **Specialise in**<br><br>**%** |
|---|---|---|---|---|
| Science | 15 | 62 | 75 | 10 |
| Only science | 5 | 2 | * | 6 |
| Mathematics | 14 | 68 | 81 | 16 |
| Only mathematics | 3 | 3 | 1 | 11 |
| Another “STEM” subject | 19 | 67 | 79 | 20 |
| Only another “STEM” subject(s) | 8 | 3 | * | 15 |
| No “STEM” subject(s) | 71 | 27 | 3 | 44 |

Not surprisingly, due to the generalist nature of primary teaching, the majority of primary practitioners are currently teaching mathematics (81%), science (75%) or another “STEM” subject (79%). Very few, however, are teaching these subjects in isolation: one percent teach only mathematics and fewer than one percent teach only science or only another “STEM” subject. More primary teachers say they currently teach a “STEM” subject than were qualified to teach these subjects. Around two-thirds say that their ITT qualified them to teach science (62%), mathematics (68%) and another “STEM” subject (67%). This difference is probably due, at least in part, to differing interpretations regarding what their ITT qualified them to teach, as noted above.

One in ten (10%) primary teachers in the Wave 6 cohort regard themselves as science specialists, compared with around one in six (16%) who specialise in mathematics and one in five (20%) who specialise in another “STEM” subject. Similar proportions (15%, 14% and 19% respectively) studied these subjects at undergraduate or post-graduate level. While the differences are slight, fewer primary teachers are current science specialists than studied

science previously, while for mathematics and other "STEM" subjects the opposite is true. The proportion of primary teachers who regard themselves as specialists in mathematics or another "STEM" subject exceeds the proportion who have ever studied one of these subjects at undergraduate or post-graduate level. Again, differing interpretations regarding what their ITT qualified them to teach is likely to have an impact here.

## Career paths of current subject specialists

It is less meaningful to look at future career paths (whether those who studied "STEM" subjects at undergraduate and post-graduate level go on to teach and specialise in these subjects) for primary practitioners because they are generalists. Neither is it meaningful to look at specific subject specialisms since biology, chemistry and physics are not taught separately at primary level. However, reviewing the background of those primary teachers who currently class themselves as specialists does give an indication as to where their specialism has come from – whether or not they studied, or were qualified to teach, the subjects they specialise in.

Table 3.9 below shows the proportion of primary teachers who currently specialise in science, mathematics or another "STEM" subject, who studied this subject to undergraduate or post-graduate level, as well as the proportion of teachers who were qualified to teach this subject by their ITT.

In reviewing the background of primary "STEM" specialists it is important to note that primary ITT by its nature is generalist; all primary teachers are qualified to teach all aspects of the primary curriculum. While some primary teachers assumed that their ITT qualified them to teach all core subjects, including science and mathematics, others cite no specific subjects perhaps because they viewed their ITT as qualifying them to teach general primary only.

**Table 3.9: Past subject specialisms of primary teachers who currently specialise in science, mathematics or another "STEM" subject**

| Profile | Specialise in science *(75)* % | Specialise in mathematics *(121)* % | Specialise in another "STEM" subject *(116)* % |
|---|---|---|---|
| **Studied at undergraduate or post-graduate level:** | | | |
| Science | **45** | 17 | 18 |
| Mathematics | 21 | **33** | 20 |
| Another "STEM" subject | 29 | 24 | **33** |
| **Qualified to teach by ITT:** | | | |
| Science | **81** | 67 | 71 |
| Mathematics | 79 | **79** | 77 |
| Another "STEM" subject | 81 | 71 | **79** |

Approaching half (45%) of primary teachers who are currently science specialists studied a science subject to degree level, although four in five (81%) say they were qualified to teach this subject by their ITT. Only a third (33%) of those who consider themselves to be mathematics specialists studied this subject to degree level, although once again four in five (79%) say their ITT qualified them to teach this subject. The same pattern is seen with those

who say they are a specialist in another “STEM” subject (33% studied at degree level and 79% were qualified to teach by ITT). Again respondents’ interpretation of qualified to teach, or indeed of studied to degree level, may be affecting responses here.

# Future intentions to remain in teaching

# 4. Future intentions to remain in teaching

This chapter explores whether the likely retention of teachers who specialise in science and mathematics is any different from teachers specialising in other subjects by examining whether teachers have left the profession or plan to in the future as well as the reasons given for leaving the profession or remaining a teacher, compared across the three groups.

Attrition from the sample due to respondent refusal and non-contact at each wave means that it is not possible to determine an overall drop-out rate of the *Becoming a Teacher* survey (i.e. the completion of respondents' NQT year and the end of respondents' NQT+3 year). However, it is possible to get some sense of retention patterns among teachers four years after qualifying by examining future intentions to remain in teaching among those in the Wave 6 cohort.

The following variables were considered in this analysis of the Wave 6 data:

- current teaching status – if working as a teacher or not, and if not, whether intending to return to teaching;
- whether respondents expect to be in teaching[12] a year after the end of the research project (i.e. in Summer 2009); and
- reasons for leaving teaching or for not expecting to be teaching in the future.

In order to compare science and mathematics specialists with other teachers, respondents first need to be assigned to one of these groups. In this analysis, therefore, the Wave 6 cohort has been split into those who are current science specialists, those who are current mathematics specialists and those who do not specialise in either science or mathematics.

## Secondary teachers

As can be seen in Table 4.1 below, among secondary school teachers in the wave 6 cohort, science specialists and mathematics specialists are more likely than their colleagues specialising in other subjects to be in a teaching post (100% compared with 94%)[13].

Among those currently teaching, there is no significant difference between specialists in terms of their intentions for the future. The majority of secondary science (95%) and mathematics (91%) specialists in the cohort expect to still be teaching in a year's time, as do the majority of specialists in other subjects (94%).

[12] While future intentions are not always an accurate predictor of people's decisions, these are the only available variables to give an indication of retention. They also offer some insight into attitudes towards teaching.
[13] It should be noted that, taking sample attrition into account, the number of teachers who are not currently teaching and not intending to teach is likely to be higher than reflected in the achieved sample.

**Table 4.1: Teaching status of secondary school teachers at Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***Wave 6 teaching status*** | *(88)* | *(85)* | *(510)* |
| Teaching | 100 | 100 | 94 |
| Looking for a teaching post | - | - | 2 |
| Not teaching/not looking for a post/ not intending to teach | - | - | 4 |
| ***Expect to be working in teaching in a year's time*** | *(87)* | *(85)* | *(480)* |
| Yes | 95 | 91 | 94 |
| No | 3 | 4 | 3 |
| Don't know | 1 | 6 | 4 |

# Primary teachers

As can be seen in Table 4.2 below, this same trend is apparent among primary teachers: science and mathematics specialists are more likely to be in a teaching post currently (97% of science specialists and 98% of mathematics specialists) compared with primary teachers specialising in other subjects (92%), although there is no difference in terms of intentions for the future (96% of primary science specialists, 95% of primary mathematics specialists and 95% of other subject specialists intend to remain in teaching in a year's time).

**Table 4.2: Teaching status of primary school teachers at Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***Teaching status*** | *(75)* | *(121)* | *578)* |
| Teaching | 97 | 98 | 92 |
| Looking for a teaching post | 1 | - | 5 |
| Not teaching/not looking for a post/ not intending to teach | 1 | 2 | 3 |
| ***Expect to be working in teaching in a year's time*** | *(72)* | *(116)* | *(549)* |
| Yes | 96 | 95 | 95 |
| No | 3 | 2 | 1 |
| Don't know | 1 | 3 | 3 |

While science and mathematics specialists are generally no more or less likely to intend to drop out of teaching than those specialising in other subjects, it is plausible that those who do leave, do so for different reasons (although due to small base sizes[14] it is not possible to draw any firm conclusions about this). Among all teachers in Wave 6, the most frequently

[14] Across each wave, fewer than ten respondents in each sub-group said they were not teaching and not intending to teach, or did not intend to remain in teaching in the future. For example, in Wave 6, only three secondary science specialists, five secondary mathematics specialists, two primary science specialists and two mathematics specialists said they do not expect to be teaching in a year's time. As such, at each of the questions about reasons for leaving teaching there are not enough respondents to make meaningful comparisons.

cited reasons for leaving teaching include: not being able to manage the workload, wanting to move into another career, and taking a break for family reasons.

Factors motivating teachers to continue to teach do not reveal any fundamental differences in attitudes and reasons for teaching between those specialising in different subject areas. As shown in table 4.3 below, across both secondary and primary teachers the factors weighted highest in motivating teachers to continue to teach are: 'Helping people to learn', 'Job satisfaction' and 'Working with children and young people'.

**Table 4.3: Factors given 'a great deal' of weight by secondary and primary teachers in motivating them to continue teaching**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| **Secondary teachers** | (86) | (80) | (491) |
| Helping people to learn | 85 | 85 | 83 |
| Job satisfaction | 76 | 68 | 66 |
| Working with children and young people | 66 | 76 | 77 |
| Job security | 42 | 40 | 47 |
| Collegiality/teamwork | 42 | 35 | 39 |
| Giving something back to the community | 38 | 45 | 45 |
| Fitting with family/other commitments | 37 | 38 | 30 |
| Long holidays | 37 | 26 | 34 |
| Opportunities for career development | 24 | 29 | 31 |
| Salary | 20 | 19 | 15 |
| **Primary teachers** | (72) | (115) | (561) |
| Helping people to learn | 85 | 79 | 85 |
| Job satisfaction | 72 | 65 | 64 |
| Working with children and young people | 71 | 73 | 78 |
| Job security | 54 | 44 | 48 |
| Collegiality/teamwork | 36 | 41 | 36 |
| Giving something back to the community | 51 | 38 | 48 |
| Fitting with family/other commitments | 33 | 30 | 29 |
| Long holidays | 40 | 34 | 38 |
| Opportunities for career development | 31 | 29 | 27 |
| Salary | 15 | 12 | 18 |

## Career development

Overall, one in five (20%) teachers in the Wave 6 cohort are currently Head of Department, a third (65%) are Subject or Curriculum Co-ordinator and one in ten (11%) are Head of Year.

## Secondary teachers

Among secondary teachers, specialists in science and mathematics are less likely than other colleagues to hold one of these three senior roles. A third (33%) of science specialists and just over a third (35%) of mathematics specialists are Subject or Curriculum Co-ordinators compared with half (50%) of secondary teachers specialising in other subjects. One in seven (15%) science specialists and one in eight (12%) mathematics specialists are Head of Department compared with just under a third (30%) of specialists in other subjects. However, they are no more or less likely to be Head of Year (8% of science specialists, 11% of mathematics specialists and 10% of other specialists).

**Table 4.4: Senior roles held by secondary school teachers in Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***Secondary teachers*** | *(88)* | *(85)* | *(485)* |
| Head of Year | 8 | 11 | 10 |
| Head of Department | 15 | 12 | 30 |
| Subject or Curriculum Co-ordinator | 33 | 35 | 50 |

Not surprisingly, teachers who are Heads of Department or Subject and Curriculum Co-ordinators are most likely to hold these roles in their specialist subjects. Among secondary school teachers who are Head of Department, eleven out of thirteen science specialists are head of a science subject and six out of ten mathematics specialists are Head of Mathematics. None of the science specialists and only two mathematics specialists in the sample are head of another "STEM" subject (including design & technology, ICT and engineering). None of the science specialists or mathematics specialists who are Head of Department are a Key Stage or Curriculum Development head, whereas three specialists in other subjects hold this role. As presented in Table 4.5 below, the same trends are apparent with Subject and Curriculum Co-ordinators.

**Table 4.5: Secondary Heads of Department and Subject/Curriculum Co-ordinators**

| | Science specialists n | Maths specialists n | Other subject specialists % |
|---|---|---|---|
| ***Head of Department*** | *(13)* | *(10)* | *(147)* |
| Science subject | 11 | - | - |
| Mathematics | - | 6 | 1 |
| Another "STEM" subject | - | 2 | 26 |
| A "non-STEM" subject | 2 | 2 | 73 |
| Key Stage or Curriculum development | - | - | 2 |
| ***Subject or Curriculum Co-ordinator*** | *(29)* | *(30)* | *(244)* |
| Science subject | 26 | - | * |
| Mathematics | 2 | 23 | * |
| Another "STEM" subject | 2 | 3 | 23 |
| A "non-STEM" subject | 5 | 3 | 68 |
| Key Stage or Curriculum development | - | - | 2 |

Note: Teachers may be Head of Department or Co-ordinator for more than one subject, hence some figures sum to more than the base total.

As well as some differences in the roles and responsibilities taken on, secondary school teachers specialising in science and mathematics also differ from teachers specialising in other subjects in terms of the activities they have undertaken. As outlined in Table 4.6 below, fewer secondary science and mathematics specialists have been involved in extra-curricular activities (although this is not a significant difference in Wave 6 with 84% of science and mathematics specialists being involved with extra-curricular activities compared with 91% of other specialists). Mathematics specialists are significantly less likely than those specialising in other subjects to have taken pupils on school trips as part of the curriculum (64% compared with 81%). However, secondary science and mathematics specialists are equally as likely as their colleagues specialising in other subjects to have covered classes.

**Table 4.6: Activities undertaken by secondary school teachers in Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***Secondary teachers*** | *(88)* | *(85)* | *(485)* |
| Covered classes | 96 | 94 | 95 |
| Involved in extra-curricular activities | 84 | 84 | 91 |
| Taken pupils on school trips | 74 | 64 | 81 |

On the whole, the aspirations of science and mathematics specialists in secondary schools are on a par with those of their colleagues specialising in other subjects (see table 4.7), although secondary science specialists are less likely to aspire to take on middle management responsibilities (57% compared with 70% of those specialising in other subjects).

**Table 4.7: Career aspirations of secondary teachers at Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***Secondary teachers who expect to be teaching in 1 year*** | (83) | (77) | (451) |
| Middle management | 57 | 60 | 70 |
| Deputy Head | 17 | 20 | 16 |
| Headteacher | 2 | - | 1 |

# Primary teachers

Four in five primary teachers are Head of Department, Subject Co-ordinator or Curriculum Co-ordinator, with no difference between subject specialists (83% of science specialists, 81% of mathematics specialists, and 81% of other subject specialists) – see table 4.8 below. However, mathematics specialists are more likely than their 'other-subject specialist' colleagues to hold a Head of Year position after four years of teaching (19% compared with 10%), although there is no difference compared with science specialists (14%).

**Table 4.8: Senior roles held by primary school teachers at Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| **Primary teachers** | *(74)* | *(119)* | *(556)* |
| Head of Year | 14 | 19 | 10 |
| Head of Department or Subject/ Curriculum Co-ordinator | 83 | 81 | 81 |

As shown in table 4.9 below, science specialists who are Heads of Department or Subject or Curriculum Co-ordinators are most likely (63%) to hold these roles in science. Slightly fewer (61%) hold their role in relation to a "non-STEM" subject (including humanities, languages and arts). The same is not true among mathematics specialists, however: less than half (42%) of mathematics specialists who are a Head of Department or Subject/Curriculum Co-ordinator hold their role in their specialist subject whereas two-thirds hold their role in a "non-STEM" subject.

**Table 4.9: Subjects for which primary teachers are Heads of Department and Subject/Curriculum Co-ordinators at Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***Head of Department or Subject/Curriculum Coordinator for:*** | *(62)* | *(96)* | *(451)* |
| Science subject | 63 | 13 | 6 |
| Mathematics | 10 | 42 | 5 |
| Another "STEM" subject | 19 | 32 | 30 |
| A "non-STEM" subject | 61 | 67 | 78 |
| Key Stage or curriculum development | 5 | 4 | 8 |
| SEN | 5 | 6 | 3 |

Table 4.10 presents the proportions of primary teachers who have undertaken certain activities in the last year. Unlike secondary teachers, primary teachers in the Wave 6 cohort specialising in science and mathematics do not differ from teachers specialising in other subjects in terms of the activities they have undertaken.

**Table 4.10: Activities undertaken by primary teachers at Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| **Primary teachers** | *(74)* | *(119)* | *(556)* |
| Covered classes | 61 | 63 | 55 |
| Involved in extra-curricular activities | 84 | 88 | 84 |
| Taken pupils on school trips | 96 | 96 | 93 |

In primary schools, those specialising in mathematics appear to be the most ambitious in their future career aspirations (see Table 4.11). They are significantly more likely to say that they are seeking promotion to Deputy Head (35%) or Headteacher (11%) than those specialising in other subjects (18% and 4% respectively).

**Table 4.11: Career aspirations of primary teachers at Wave 6**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| **Primary teachers who expect to be teaching in 1 year** | *(69)* | *(110)* | *(524)* |
| Middle management | 58 | 46 | 54 |
| Deputy Head | 26 | 35 | 18 |
| Headteacher | 6 | 11 | 4 |

# Attitudes towards and experiences of teaching

# 5. Attitudes towards and experiences of teaching

This chapter explores the recent experiences of teachers currently specialising in science and mathematics.

## Secondary teachers

### Overall attitudes towards teaching

Virtually all teachers (99%) in the Wave 6 sample rate themselves as an effective teacher and more than nine in ten (93%) say they enjoy teaching. However, as shown in Table 5.1, science and mathematics specialists at secondary level tend to be slightly less positive than their colleagues who specialise in other subjects, being more likely to rate themselves as a 'fairly effective' teacher as opposed to a 'very effective' one. Whereas six in ten specialists in other subjects (60%) rate themselves as 'very effective', less than half of science specialists (42%) and mathematics specialists (47%) rate themselves in this way.

Table 5.1 also indicates that secondary mathematics specialists are significantly less likely than other specialists to say they 'strongly agree' with the statement 'I enjoy working as a teacher'. Whereas seven in ten specialists in other subjects (70%) 'strongly agree', six in ten mathematics specialists (58%) say the same. Six in ten science specialists (61%) also 'strongly agree' with the statement, although this is not significantly fewer than the proportion of specialists in other subjects 'strongly agreeing'.

**Table 5.1: Personal ratings of secondary school teachers**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***How would you rate your effectiveness as a teacher?*** | *(88)* | *(85)* | *(485)* |
| Very effective | 42 | 47 | 60 |
| Fairly effective | 56 | 53 | 39 |
| Not very/at all effective | 1 | - | 1 |
| ***To what extent do you agree or disagree with the statement 'I enjoy working as a teacher'?*** | *(88)* | *(85)* | *(494)* |
| Strongly agree | 61 | 58 | 70 |
| Tend to agree | 30 | 35 | 21 |
| Neither agree nor disagree | 2 | 5 | 4 |
| Tend to/strongly disagree | 7 | 2 | 5 |

## Teaching experiences

As noted in the previous section, there are some differences between science and mathematics specialists, and specialists in other subjects, in terms of personal ratings of effectiveness and enjoyment of teaching. This section now looks at where else, if at all, their experiences of teaching differ.

In Wave 6 (their fourth year of teaching), secondary teachers report that they work on average 14 hours and 30 minutes overtime in a standard working week although mathematics specialists work approximately an hour less than both science and other subject specialists (13 hours 48 minutes compared with 14 hours 45 minutes and 14 hours 36 minutes).

The amount of non-contact time that secondary teachers get is approximately 3 hours 45 minutes, with no significant difference between specialists.

There is also little difference in the ratings of support received by different practitioners. Teachers were asked how they would rate the support received since the previous September (i.e. in the last academic year). Currently, about seven in ten secondary teachers across each specialism rate it as good or very good (69% of science specialists, 70% of mathematics specialists and 64% of specialists in other subjects).

## CPD opportunities

Three-quarters of secondary science specialists (75%) in the Wave 6 cohort and slightly more mathematics specialists (78%) report that they have undertaken some form of training or professional development in the last 12 months, not significantly different to the number of specialists in other subjects (83%) who have undertaken CPD (see Table 5.2).

Secondary mathematics specialists are more likely than other specialists to say they have not needed CPD in 2007 (20% compared with 10% agree with the statement 'I have not felt that I needed CPD at any time since September 2007'; 12% of science specialists agree). This difference is not apparent among primary teachers, however.

**Table 5.2: Secondary teachers' experiences of CPD**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***Secondary teachers*** | *(88)* | *(85)* | *(485)* |
| I have received training or CPD since Sept 2007 | 75 | 78 | 83 |
| I have not felt that I needed CPD at any time since Sept 2007 | 12 | 20 | 10 |
| ***Secondary teachers who have received CPD*** | *(66)* | *(66)* | *(404)* |
| The CPD I have received has been tailored to meet my needs | 53 | 68 | 56 |
| The CPD I have experienced has generally been of a high quality | 59 | 71 | 71 |

There are no differences between different subject specialists in relation to the focus of training undertaken (i.e. relating to behaviour management, workload management, critical reflection and career development) by science, mathematics and other specialists.

More than a quarter of all secondary teachers feel they would benefit from additional training or CPD in staff supervision/management skills (28% of science specialists, 24% of mathematics specialists and 27% of teachers specialising in other subjects). However, the next most commonly mentioned area for training among mathematics specialists is using ICT in subject teaching (14%) and using a range of teaching methods (12%) whereas more science specialists and other specialists feel that they would benefit from developing their knowledge and understanding of the National Curriculum (18% and 17% respectively). Furthermore, one in eight science specialists feel they would benefit from developing their knowledge of other teaching subjects (12% compared with 2% of mathematics specialists and 7% of other specialists).

# Primary teachers

## Overall attitudes towards teaching

In contrast to secondary teachers, primary teachers specialising in science are *more* likely to rate themselves as a 'very effective' teacher and those specialising in mathematics *more* likely to 'strongly agree' with the statement 'I enjoy working as a teacher' than specialists in other subjects (see Table 5.3). Two-thirds of primary science specialists (65%) and six in ten mathematics specialists rate themselves as 'very effective' compared with just over half (52% of specialists in other subjects. Three-quarters of mathematics specialists (74%) and slightly fewer science specialists (72%) 'strongly agree' with the statement 'I enjoy working as a teacher' compared with two-thirds of specialists in other subjects (65%).

**Table 5.3: Personal ratings of primary school teachers**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***How would you rate your effectiveness as a teacher?*** | *(74)* | *(119)* | *(556)* |
| Very effective | 65 | 61 | 52 |
| Fairly effective | 34 | 40 | 48 |
| Not very/at all effective | - | - | * |
| ***To what extent do you agree or disagree with the statement 'I enjoy working as a teacher'?*** | *(75)* | *(121)* | *(564)* |
| Strongly agree | 72 | 74 | 65 |
| Tend to agree | 21 | 24 | 28 |
| Neither agree nor disagree | 1 | 1 | 4 |
| Tend to/strongly disagree | 5 | 2 | 3 |

## Teaching experiences

Primary teachers specialising in other subjects work on average 20 hours 36 minutes overtime in a standard working week, more than the average secondary teacher. However, primary science specialists and mathematics specialists work on average fewer extra hours (16 hours 6 minutes and 16 hours 18 minutes respectively). The amount of non-contact time that primary teachers get is approximately 2 hours 30 minutes, with no significant difference between specialists.

There is also no difference in the ratings of support received by different practitioners. About seven in ten primary teachers across each specialism rate it as good or very good (65% of science specialists, 69% of mathematics specialists and 67% of specialists in other subjects).

## CPD opportunities

More primary teachers than secondary teachers have undertaken training, although as Table 5.4 shows, primary science and mathematics specialists are no more or less likely to have done so than primary specialists in other subjects (87%, 82% and 86% respectively).

**Table 5.4: Primary teachers' experiences of CPD**

| | Science specialists % | Maths specialists % | Other subject specialists % |
|---|---|---|---|
| ***Primary teachers*** | *(74)* | *(119)* | *(556)* |
| I have received training or CPD since Sept 2007 | 87 | 82 | 86 |
| I have not felt that I needed CPD at any time since Sept 2007 | 10 | 11 | 12 |
| ***Primary teachers who have received CPD*** | *(64)* | *(97)* | *(480)* |
| The CPD I have received has been tailored to meet my needs | 75 | 77 | 74 |
| The CPD I have experienced has generally been of a high quality | 84 | 88 | 83 |

There are no differences among primary teachers in the focus of training undertaken (i.e. relating to behaviour management, workload management, critical reflection and career development) by science, mathematics and other specialists.

Primary teachers' training needs are very similar to those of secondary teachers. The most common area of need is also staff supervision/management skills (26% of science specialists, 30% of mathematics specialists and 20% of specialists in other subjects). Developing knowledge and understanding of the National Curriculum (10% of science specialists, 9% of mathematics specialists and 13% of specialists in other subjects) and developing knowledge of other teaching subjects (15%, 10% and 9% respectively) are the next most commonly mentioned areas in which primary teachers would benefit from CPD.

# Training bursaries and golden hellos

# 6. Training bursaries and golden hellos

The impact of training bursaries and 'golden hellos' on beginning teachers' training choices is explored briefly in this chapter.

## Tax-free training bursaries

Over four in five Wave 6 respondents who trained through a university-based or flexible PGCE or a SCITT (82%) received a training bursary, with men more likely than women to report that this was the case (87% versus 80%).

However, a little over half (51%) of those who received a tax-free training bursary say that its availability did *not* influence their decision to train to teach in a particular subject or subjects *at all*. When we look at those (31% of training bursary recipients) who say the availability of a training bursary influenced their decision to train to teach a particular subject or subjects '*a great deal/a fair amount'*, no differences emerge by over-arching subject area[15] (for example, teachers of science versus teachers of mathematics, or teachers of science versus teachers of English)[16].

## Golden hellos

Just over two in five Wave 6 respondents who trained through a university-based or flexible PGCE or a SCITT and completed their induction (41%) received a "golden hello". Men are significantly more likely than women to say they received one (51% versus 37%), as are those who received a training bursary (45% versus 18%). However, it is worth bearing in mind the considerable degree of overlap between these two sub-groups (with men more likely than women to say they received a training bursary).

By over-arching subject area, teachers of languages (69%), science (63%), technology (53%), mathematics (56%) and English (63%) are also more likely than teachers of humanities[17] (10%) or general primary (3%) to say they received a golden hello.

As with training bursaries, over half (51%) of those who received a "golden hello" say that its availability did *not* influence their decision to specialise in a particular subject or subjects during ITT *at all*. When we look at those (24% of golden hello recipients) who say the availability of a "golden hello" influenced their decision to train to specialise in a particular subject or subjects during ITT '*a great deal/a fair amount'*, teachers of English (26%),

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[15] Question A18 of the Wave 6 BaT questionnaire records the '*subjects or area specialisms … taught in the last school year'* by each respondent. For analysis purposes, these were then grouped under the following over-arching subject area headings:

- Maths – any respondent who said that they taught maths in the last school year.
- English – any respondent who said that they taught English in the last school year.
- Science – any respondent who said they taught biology and/or chemistry and/or physics and/or science in the last school year.
- Humanities – any respondent who said they taught classics and/or geography and/or history and/or RE and/or social sciences (including business studies, economics, sociology, politics and psychology] in the last school year.
- Languages – any respondent who said that they taught MFL in the last school year.
- Technology – any respondent who said that they taught design and technology and/or ICT in the last school year.
- General primary – any respondent who said that they taught general primary in the last school year.
- Other – any respondent who said that they taught art and/or dance and/or drama and/or music and/or PSHE and/or PE.

Please note that although each respondent appears only once in the base for each over-arching subject area, the same respondent may appear in the base for several over-arching subject areas (for example, English **and** Humanities; i.e. the sub-groups are not mutually exclusive).

[16] Indicative finding: some small bases sizes (50 respondents or fewer).

[17] Golden hellos were only available to teachers of subjects defined as shortage areas. Humanities and general primary were not included. Therefore the low responses are as expected.

technology (32%) and languages (34%) are significantly more likely than teachers of mathematics to say it did so[18].

Regarding their decision to stay in teaching on completion of induction, just under half (49%) of those who received a "golden hello" say that its availability did *not* influence their decision to continue with teaching *at all*. Teachers of mathematics are significantly more likely than teachers of technology to say this (57% versus 36%). When we look at those (25% of golden hello recipients) who say the availability of a "golden hello" influenced their decision to continue with teaching post-induction '*a great deal/a fair amount'*, teachers of technology (38%) are significantly more likely than teachers of mathematics (19%) to say it did so. However, no other significant differences by over-arching subject area emerge[19].

[18] As above.
[19] As above.

# Appendices

# Appendices

## Appendix 1: TOPLINE FINDINGS

# BECOMING A TEACHER WAVE 6
# TOPLINE RESULTS FOR STEM SECTION – 01.09.08

- Results are based on a telephone survey of 1,443 respondents who completed their initial teacher training in June/July 2004, via different ITT routes and ITT providers throughout England.
- Fieldwork was carried out between 2 June and 27 July 2008 by Ipsos MORI Social Research Institute.
- Data are unweighted.
- The base is all respondents, unless stated otherwise.
- An asterisk (*) represents a value of less than half a per cent, but not zero.
- Where less than 30 respondents answered a question, results are given in numerics (N) rather than percentages.
- **Please note that where percentages do not add up to 100, this is due to computer rounding, multiple responses or the exclusion of don't know/not stated categories.**

ST1. **In training to be a teacher, did you receive a tax-free, training bursary?**
*Base: All who trained through a university-based PGCE, flexible PGCE or SCITT (679)*

| | % |
|---|---|
| Yes | 82 |
| No | 16 |
| Don't know | 3 |

ST2. **How far, if at all, did the availability of a tax-free, training bursary influence your decision to train to teach in the subject or subjects you chose, as opposed to a different subject or subjects? Would you say that it influenced you … ?**
*Base: All who trained through a university-based PGCE, flexible PGCE or SCITT and received a tax-free training bursary (555)*

| | % |
|---|---|
| A great deal | 17 |
| A fair amount | 14 |
| Not very much | 14 |
| Not at all | 54 |
| Don't know | 1 |

ST3. **After you completed your induction, did you receive a golden hello?**
*Base: All who trained through a university-based PGCE, flexible PGCE or SCITT and completed their induction (664)*

| | % |
|---|---|
| Yes | 41 |
| No | 59 |
| Don't know | - |

ST4. **How far, if at all, did the availability of a golden hello influence your decision to specialise in the subject or subjects you chose to pursue during initial teacher training? Would you say that it influenced you … ?**
*Base: All who trained through a university-based PGCE, flexible PGCE or SCITT and received a "golden hello" (269)*

| | % |
|---|---|
| A great deal | 10 |
| A fair amount | 13 |
| Not very much | 20 |
| Not at all | 51 |
| Don't know | 5 |

ST5. **How far, if at all, did the availability of a golden hello influence you to continue with teaching on completion of your induction? Would you say that it influenced you …?**
*Base: All who trained through a university-based PGCE, flexible PGCE or SCITT and received a "golden hello" (269)*

| | % |
|---|---|
| A great deal | 7 |
| A fair amount | 17 |
| Not very much | 21 |
| Not at all | 49 |
| Don't know | 5 |

ST6.A **Which of the following subjects, if any, did your Initial Teacher Training qualify you to teach, even if you did not regard that subject/those subjects as a subject specialism on completion of your Initial Teacher Training?**
*Base: All (1,443)*

ST6.B **Please can you tell me which of the following subjects, if any, you studied AT UNDERGRADUATE OR POST-GRADUATE DEGREE LEVEL? This would include a subject or subjects forming part of a single honours, joint honours or combined honours degree that you took prior to Initial Teacher Training, AND/OR a subject or subjects that you specialised in (in the sense that you had majored in that subject/those subjects) on completion of your Initial Teacher Training.**
*Base: All (1,443)*

| | | ST6.A % | ST6.B % |
|---|---|---|---|
| A | Biology | 10 | 8 |
| B | Chemistry | 9 | 5 |
| C | Physics | 9 | 4 |
| D | Combined, balanced or general science | 39 | 8 |
| E | Another science (excluding engineering) | 2 | 6 |
| F | Design and Technology | 36 | 7 |
| G | Information and Communications Technology (ICT) | 43 | 12 |
| H | Engineering | 2 | 3 |
| I | Business studies | 5 | 5 |
| J | Economics | 2 | 3 |
| K | Maths | 44 | 14 |
| | None of these | 37 | 60 |
| | Don't know | * | * |

ST7. **Since you qualified as a teacher, which of the following subjects, if any, have you taught?**
*Base: All (1,443)*

ST8. **And which of the following subjects, if any, do you still teach?**
*Base: All who have taught a STEM (or potentially related) subject since qualifying as a teacher (1,062)*

| | | ST7 % | ST8 % |
|---|---|---|---|
| A | Biology | 12 | 13 |
| B | Chemistry | 10 | 12 |
| C | Physics | 10 | 11 |
| D | Combined, balanced or general science | 49 | 60 |
| E | Another science (excluding engineering) | 2 | 2 |
| F | Design and Technology | 46 | 58 |
| G | Information and Communications Technology (ICT) | 56 | 66 |
| H | Engineering | 1 | 1 |
| I | Business studies | 5 | 4 |
| J | Economics | 2 | 2 |
| K | Maths | 56 | 68 |
| | None of these | 26 | 9 |
| | Don't know | * | * |

ST9. **Which of the following subjects, if any, would you regard as a subject specialism now?**
*Base: All who still teach a STEM (or potentially related) subject (960)*

| | | % |
|---|---|---|
| A | Biology | 5 |
| B | Chemistry | 4 |
| C | Physics | 3 |
| D | Combined, balanced or general science | 9 |
| E | Another science (excluding engineering) | 1 |
| F | Design and Technology | 9 |
| G | Information and Communications Technology (ICT) | 19 |
| H | Engineering | - |
| I | Business studies | 3 |
| J | Economics | * |
| K | Maths | 22 |
| | None of these | 39 |
| | Don't know | * |

ST10. **You've said that you would regard … as a subject specialism. Can you please give me the main reasons for why you've specialised in this subject since the completion of your Initial Teacher Training?**
*Bases: All who regard a STEM (or potentially related) subject that was not studied at undergraduate or post-graduate degree level as a specialism*
**NB. Some small or very small base sizes; to avoid a mix of numerics and percentages, all findings are reported as percentages but percentages based on sub-30 bases appear in smaller font**

| | A (6) % | B (10) % | C (6) % | D (80) % | E (5) % | F (40) % | G (109) % | H (0) % | I (4) % | J (0) % | K (107) % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Personal interest in the subject | 50 | 80 | 50 | 53 | 40 | 38 | 56 | - | - | - | 53 |
| Started to teach it as a non-specialist but found I enjoyed it | - | 20 | - | 7 | 20 | 8 | 14 | - | - | - | 7 |
| Increased opportunities for career progression in 'shortage' subjects | - | 10 | 33 | 7 | 20 | 8 | 8 | - | - | - | 9 |
| No-one else with this specialism at this school | - | 10 | 17 | 8 | 20 | 20 | 10 | - | - | - | 9 |
| Additional pay or incentives provided by the school | - | - | - | 3 | - | 3 | 1 | - | - | - | - |
| Availability of training bursary | - | - | - | - | - | - | - | - | - | - | - |
| Availability of 'golden hello' | - | - | - | - | - | - | - | - | - | - | - |
| Other | 33 | 10 | 17 | 40 | 20 | 38 | 33 | - | 100 | - | 33 |
| Don't know | 17 | - | - | 3 | - | 3 | 4 | - | - | - | 1 |

ST11. **And what steps, if any, have you taken to develop your specialism in … ? Any others?**
*Bases: All who regard a STEM (or potentially related) subject that was not studied at undergraduate or post-graduate degree level as a specialism*
**NB. Some small or very small base sizes; to avoid a mix of numerics and percentages, all findings are reported as percentages but percentages based on sub-30 bases appear in smaller font**

| | A (6) % | B (10) % | C (6) % | D (80) % | E (5) % | F (40) % | G (109) % | H (0) % | I (4) % | J (0) % | K (107) % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Self-taught (picked it up as I've gone along) | 17 | 40 | 17 | 28 | 40 | 23 | 29 | - | - | - | 28 |
| CPD/INSET provided by a specialist provider (e.g. AST, LA, subject association etc.) | 17 | 20 | 33 | 13 | - | 30 | 24 | - | - | - | 20 |
| CPD/INSET provided by the National Science Learning Centre | 17 | - | - | 7 | 20 | - | 1 | - | - | - | - |
| Peer-led CPD/INSET provided by colleagues at this school | - | - | 17 | 8 | - | 15 | 18 | - | 25 | - | 19 |
| Peer-led CPD/INSET provided by colleagues from other schools | - | - | - | 7 | - | 8 | 8 | - | - | - | 8 |
| CPD/INSET provided by/ through the 'National Strategies' | - | - | 17 | 8 | - | 5 | 6 | - | - | - | 11 |
| CPD/INSET provided by the National Centre for Excellence in Mathematics (NCETM) | - | - | - | - | - | - | 1 | - | - | - | 2 |
| CPD/INSET provided by a local Science Learning Centre | - | 10 | 17 | 2 | - | 3 | 4 | - | - | - | 3 |
| Post-ITT undergraduate degree, post-graduate degree or doctorate | - | - | - | 3 | - | - | 1 | - | - | - | 4 |
| Other | 33 | 40 | 17 | 27 | - | 28 | 25 | - | 75 | - | 26 |
| Don't know | 17 | 10 | - | 13 | 40 | 15 | 16 | - | - | - | 7 |

ST12. **For each of the following subjects, please can you tell me which key stage(s) you teach?**
*Bases: All who still teach a STEM(or potentially related) subject*
**NB. Some small or very small base sizes; to avoid a mix of numerics and percentages, all findings are reported as percentages but percentages based on sub-30 bases appear in smaller font**

| | | KS1 | KS2 | KS3 | KS4 | Post-16 | None | Don't know |
|---|---|---|---|---|---|---|---|---|
| | | % | % | % | % | % | % | % |
| A | Biology (n=134) | 19 | 29 | 46 | 44 | 19 | 2 | - |
| B | Chemistry (n=123) | 15 | 31 | 51 | 50 | 15 | 2 | - |
| C | Physics (n=119) | 17 | 29 | 49 | 45 | 3 | 3 | - |
| D | Combined, balanced or general science (n=642) | 37 | 53 | 11 | 8 | 1 | 7 | * |
| E | Another science (excluding engineering) (n=25) | 24 | 36 | 20 | 28 | 24 | 4 | - |
| F | Design and Technology (n=614) | 38 | 52 | 9 | 7 | 4 | 8 | - |
| G | Information and Communications Technology (ICT) (n=699) | 36 | 49 | 14 | 12 | 6 | 8 | - |
| H | Engineering (n=8) | 13 | 50 | 13 | 38 | - | - | - |
| I | Business studies (n=46) | 4 | 20 | 15 | 74 | 43 | - | - |
| J | Economics (n=16) | 44 | 56 | - | - | 19 | - | - |
| K | Maths (n=726) | 35 | 50 | 16 | 12 | 6 | 8 | - |

**Since you qualified as a teacher, we understand that you have been a Head of Department or a subject/curriculum co-ordinator*.**

ST13. **Please can you tell me for which subject or subjects you have been a Head of Department?**
*Base: All who have been Head of Department at any time since Wave 2 (277)*

ST14. **Please can you tell me which for subject or subjects you have been a subject/curriculum co-ordinator?**
*Base: All who have been Subject/Curriculum Co-ordinator at any time since Wave 2 (902)*

| | | ST13 % | ST14 % |
|---|---|---|---|
| A | Biology | 1 | 1 |
| B | Chemistry | 2 | 1 |
| C | Physics | 2 | 1 |
| D | Combined, balanced or general science | 6 | 10 |
| E | Another science (excluding engineering) | 1 | 1 |
| F | Design and Technology | 6 | 10 |
| G | Information and Communications Technology (ICT) | 14 | 16 |
| H | Engineering | - | - |
| I | Business studies | 4 | 1 |
| J | Economics | * | * |
| K | Maths | 8 | 9 |
| | Other | 67 | 73 |
| | Have not been a Head of Department OR Have not been Subject/Curriculum Co-ordinator | 5 | 2 |
| | Don't know | * | * |

*Respondents' self-reported roles; some respondents may appear in both sub-groups.

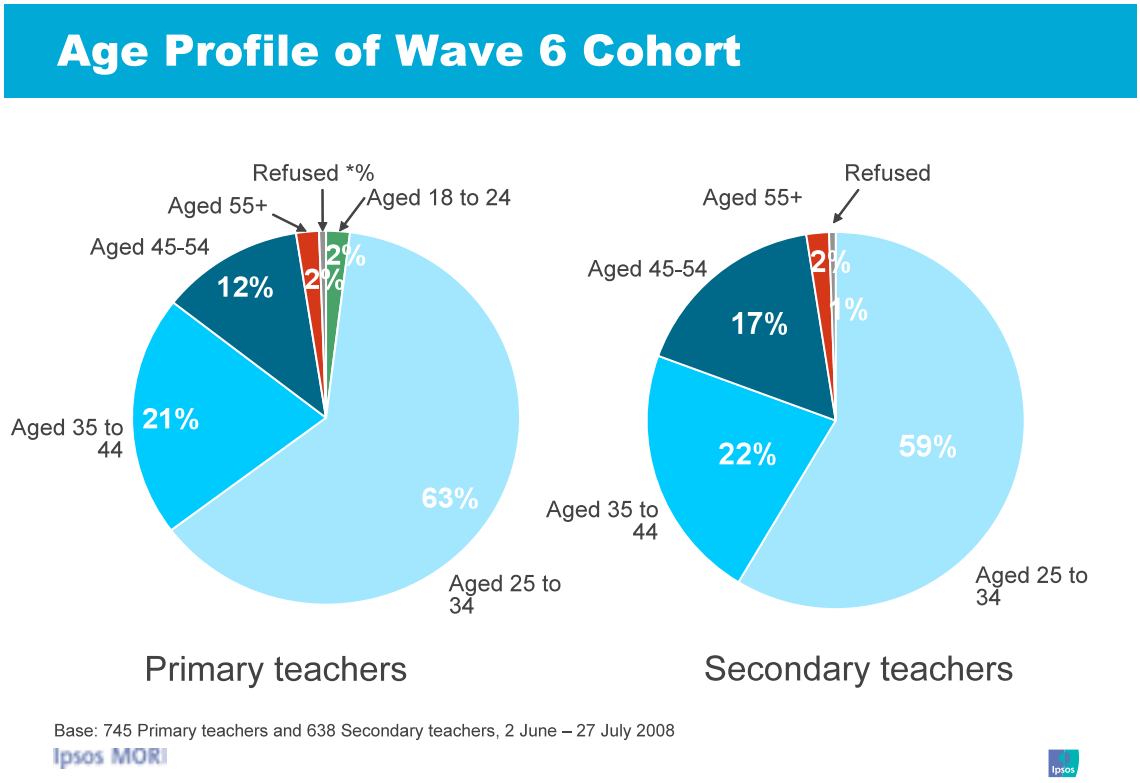
## Appendix 2: SAMPLE PROFILE

The majority of analysis in this report is based on the *Becoming a Teacher* Wave 6 achieved sample of 1,443 respondents who completed their initial teacher training in 2004. The sample is divided into 638 secondary teachers and 745 primary teachers[20] based on the age groups they taught in the 2007-2008 academic year. The profile of these two sub-groups is given below.

## Age

The chart below summarises the age profile of primary and secondary teachers in the Wave 6 sample. The two profiles are very similar with the majority of beginning teachers aged 25-34 (63% and 59% respectively). However, the profile of secondary teachers in the sample tends towards the slightly older, with no 18-24 year olds and four in ten (41%) aged 44 or over compared with a third (35%) of primary teachers.

**Figure 1**

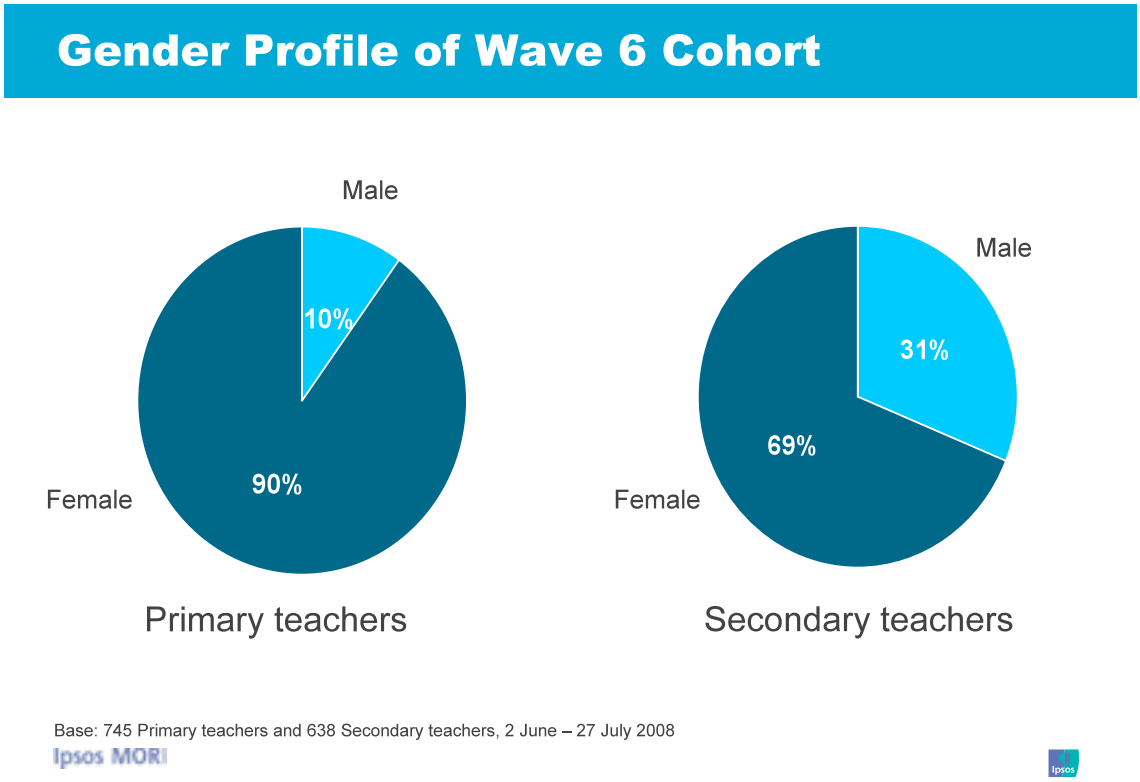



## Gender and ethnicity

Nine in ten (90%) of the Wave 6 sample of primary teachers are female, while just one in ten are male (10%). The sample of secondary teachers has a higher proportion of male teachers: three in ten (31%) are male while seven in ten (69%) are female.

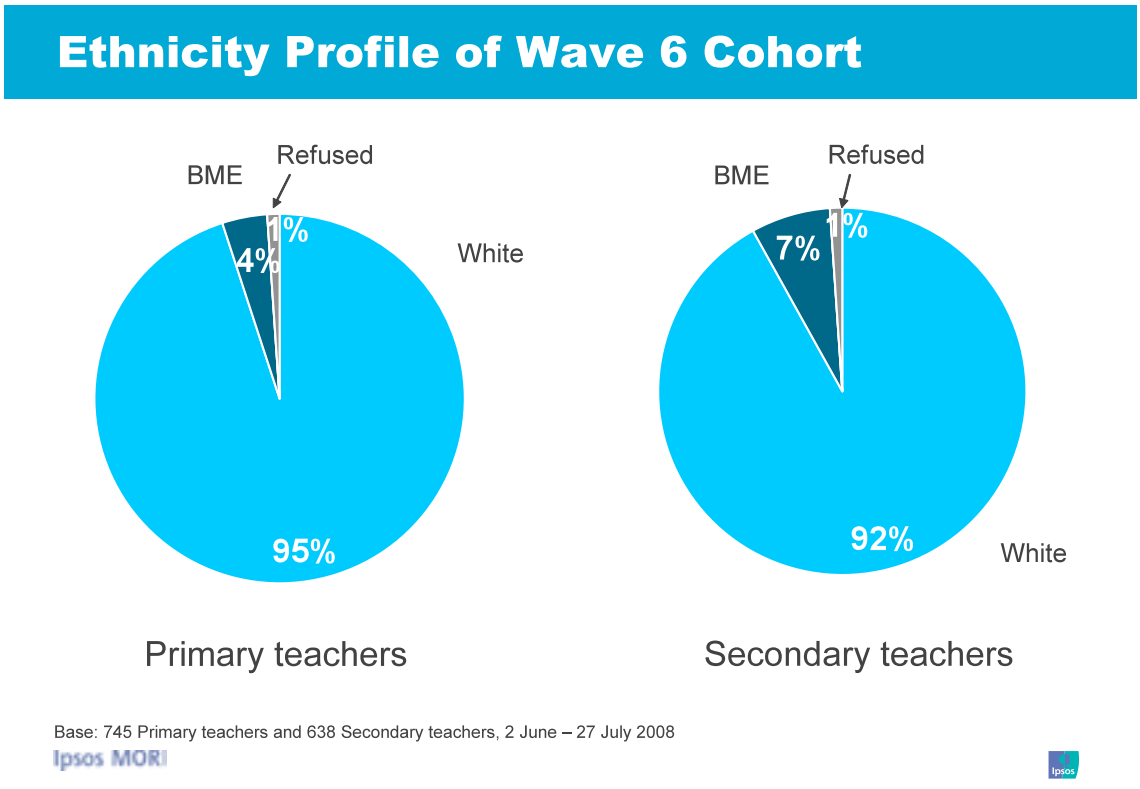
[20] There are 60 respondents who cannot be categorised as either primary or secondary due to missing or contradictory information.

**Figure 2**




The vast majority of both the primary and secondary samples are white (95% and 92% respectively); just 4% and 7% respectively are from a black or minority ethnic (BME) background.

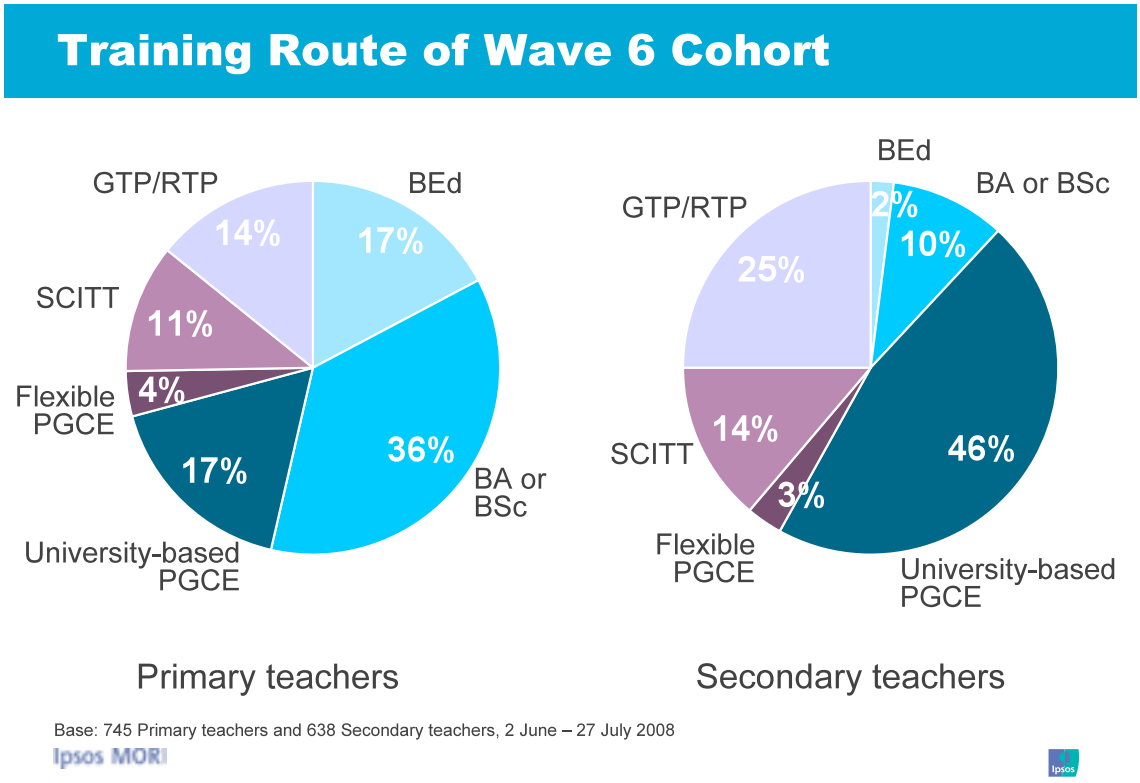
**Figure 3**



## Training route

The following chart summarises the training route taken by respondents in each sample[21]. Almost half (46%) of secondary teachers studied for a university-based PGCE and a quarter (25%) followed the GRTP training route. Over a third (36%) of primary teachers in the sample studied for a BA or BSc, with one in six (17%) having studied for a BEd and a further one in six (17%) for a university-based PGCE. These profiles are broadly in line with that of the original Wave 1 cohort.

**Figure 4**




It is important to note again here that this cohort is not representative of all teachers who trained to be a teacher in 2003/04. The stratified sample for the BaT project was designed to ensure sufficient responses from all six training routes for meaningful, cross-route analysis, rather than a sample which was representative overall of the population of initial teacher trainees. As a result, some training routes are over- or under-represented compared to a proportionately representative cross-section of all teacher trainees in the 2003-2004 academic year.

[21] Routes examined were: University-administered Post-Graduate Certificate in Education (PGCE); the Flexible PGCE; the Bachelor of Education (BEd); the Bachelor of Arts/Science with Qualified Teacher Status (BA/BSc QTS); School-Centred Initial Teacher Training (SCITT programmes); and the Graduate and Registered Teacher Programmes (GRTP).

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