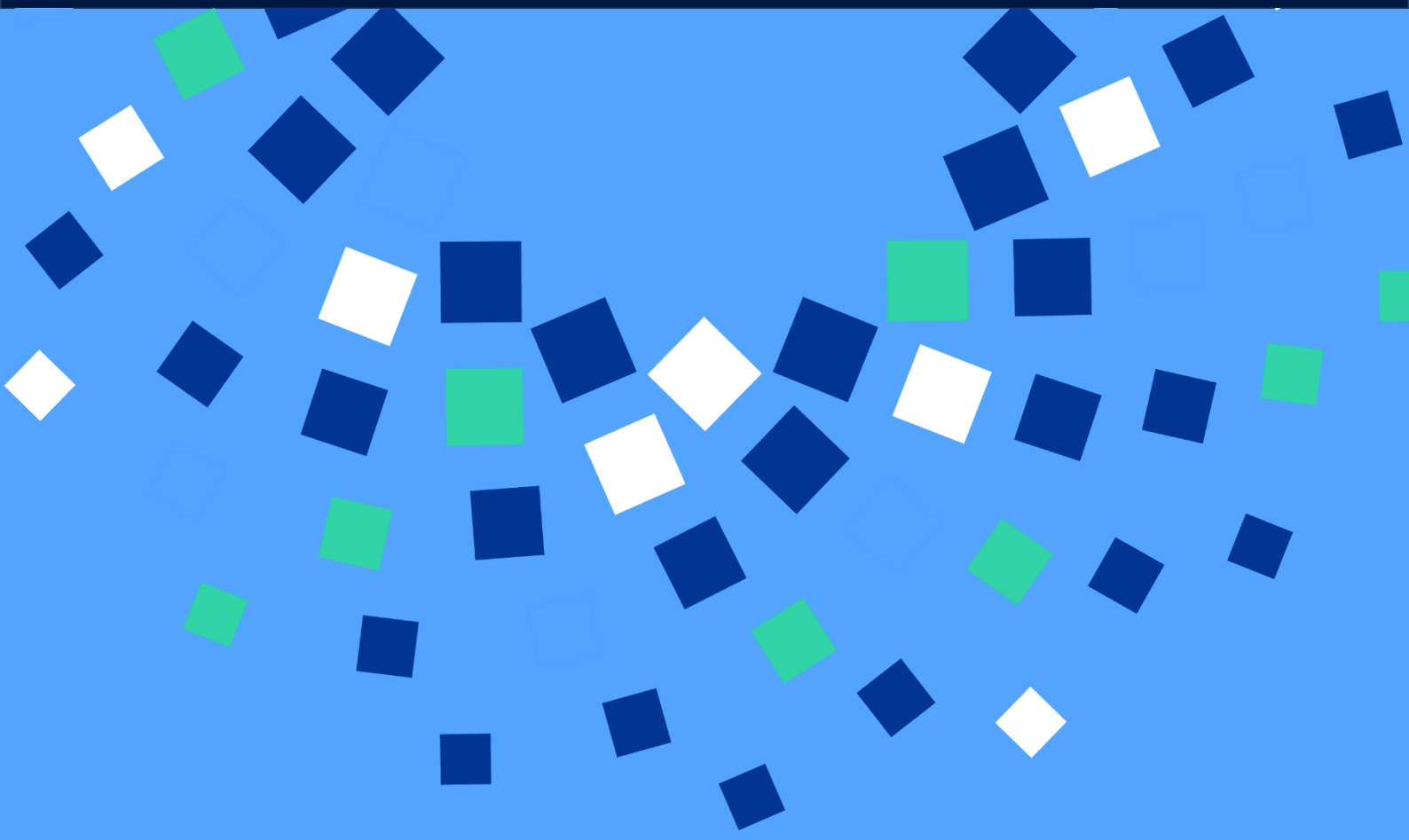
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Data Insight

The science teaching workforce in Wales

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Introduction

Summary

This Data Insight provides an overview of the science teaching workforce in state-maintained secondary school in Wales as of 2021. Using administrative data from the School Workforce Annual Census (SWAC), it examines the proportion of the science teaching workforce who deliver individual subjects of science, biology, chemistry, and physics, and how they are distributed across sex, stage of education, language medium, and school geography. This provides evidence to inform discussions on workforce planning and distribution in compulsory and post-16 science education across Wales.

Background

Shortfalls in scientific skills in science, technology, engineering, and technology (STEM) industries have been a longstanding concern in the UK and internationally (1,2). These concerns are only intensifying as societies face increasingly complex and science-driven challenges, from climate change and public health to misinformation and cybersecurity.

Consequently, scientific literacy and capability are no longer confined to specialist professions but are becoming foundational across a wide range of occupations and civic contexts.

In Wales, science is a key component of workforce demand and ambitions for economic growth and innovation (3,4). However, recent evidence suggests a decline in Wales' science proficiency. Welsh Government reported a decline in year 11 pupils' science performance between 2017/18 and 2024/25, and consistently lower performance in science when compared to literacy and numeracy (5). The most recent Programme for International Student Assessment (PISA) shows that Wales scored significantly lower than the OECD average in science, and lower than its own performance in 2018 (6).

While the factors shaping young people's participation and achievement in science are complex and multifaceted, one important factor is the capacity and composition of the science teacher workforce.

Each year, various information is published on the demographics of the teaching workforce in Wales. However, rarely is it apparent how these demographics present at the subject-level. For example, while females make up a greater proportion of the secondary school teaching workforce than males (65% versus 35%) (7), how gender profiles present across different subjects is much less apparent. This is important in the context that among pupils, there are considerable gender imbalances across subjects, for example females are overrepresented in biology at A-level, but underrepresented in physics (8).

However, data around teacher recruitment is more commonly reported at a subject-level. While recruitment challenges are faced across many subjects in Wales (9), science, particularly chemistry and physics, portrays a particularly troubling landscape. In 2024/25, Welsh Government set the desired national intake for initial teacher education (ITE, a mandatory professional training process in order to reach qualified teacher status) in biology, chemistry, and physics at 73, 67, and 67 respectively (10). However just 17 completed training in biology (23%), none in chemistry (0%), and nine in physics (13%). Of these, just three trained through the medium of Welsh (11).

These shortfalls are not new, and national initiatives and incentives to address them have had limited impact. For initiatives to be appropriately targeted across different subjects, a more granular insight into the demographics of the existing workforce is crucial. This will provide a more complete picture of where

workforce gaps lie across individual subjects and demographics. For example, is the representation of Welsh-medium teachers in the workforce unanimous across biology, chemistry, and physics?

Administrative education data provides a valuable opportunity to examine the teacher workforce with this level of granularity. School workforce records capture teachers' subject responsibilities, their sex, the stages of education they teach, and characteristics of the schools in which they work. This Data Insight therefore provides new evidence on the composition and distribution of the science teaching workforce in Wales.

What we did

This research made use of the School Workforce Annual Census (SWAC) in Wales. SWAC enabled the identification of all qualified teachers delivering science, biology, chemistry, and physics in state-maintained secondary schools in Wales (collectively referred to herein as the 'science teaching workforce').
SWAC data were used to examine the distribution of the science teaching workforce by:

- Science subject taught (science, biology, chemistry, physics)
- Sex (male or female)
- Age group of pupils taught
- Language medium of teaching (English or bilingual/Welsh)
- School geography by local authority, classified using the Office for National Statistics' Rural Urban Classification system (12).

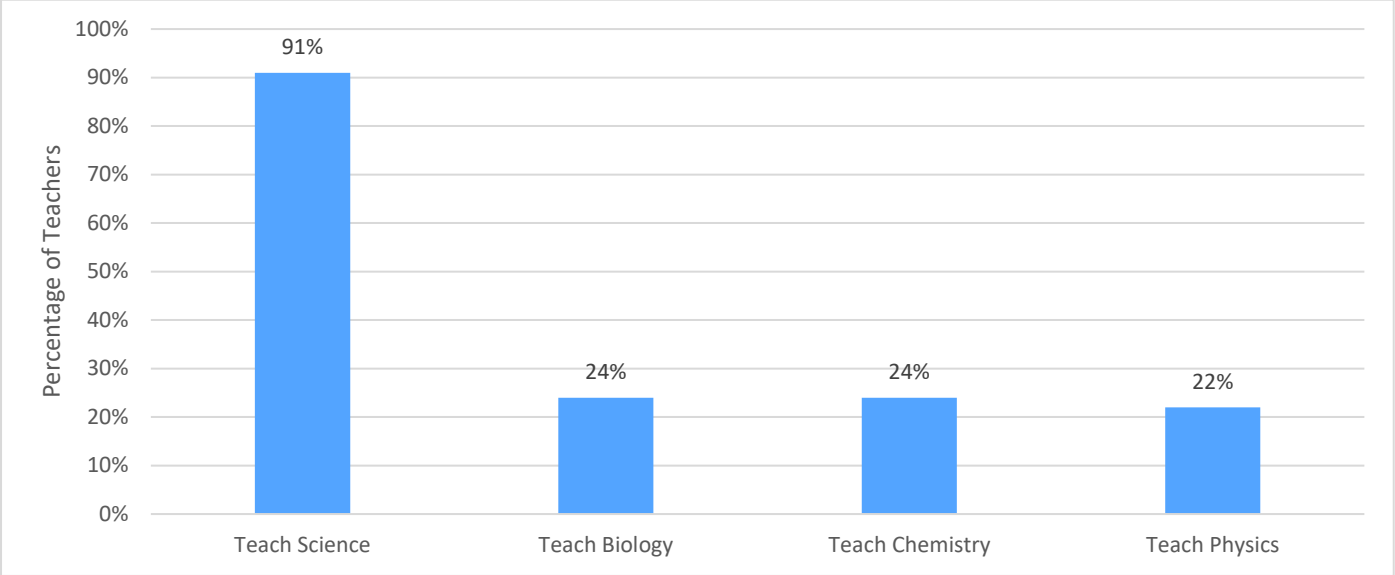
While ethnic representation of the teaching workforce is also an important factor, the subset of teachers only delivering science subjects was not large enough to explore this demographic. Indeed, as of 2024 only 340 of the entire teaching workforce (across primary and secondary schools) were Black, Asian, Mixed or Other ethnicity (7).

What we found

In 2021, there were 1,820 qualified science teachers in state-maintained secondary schools in Wales. Teachers could be recorded as teaching one or a multiple of science, biology, chemistry, and physics. Specifically, 46% of teachers delivered one science subject, 48% taught two, 5% taught three, and 1% taught all four science subjects.

Overall, 91% of the science teaching workforce taught science, 24% taught biology, 24% taught chemistry, and 22% taught physics (Figure 1). In terms of teaching multiple science subjects, the most popular combination was biology and science, which was taught by 18% of teachers. This was followed by chemistry and science (16%), and physics and science (14%).

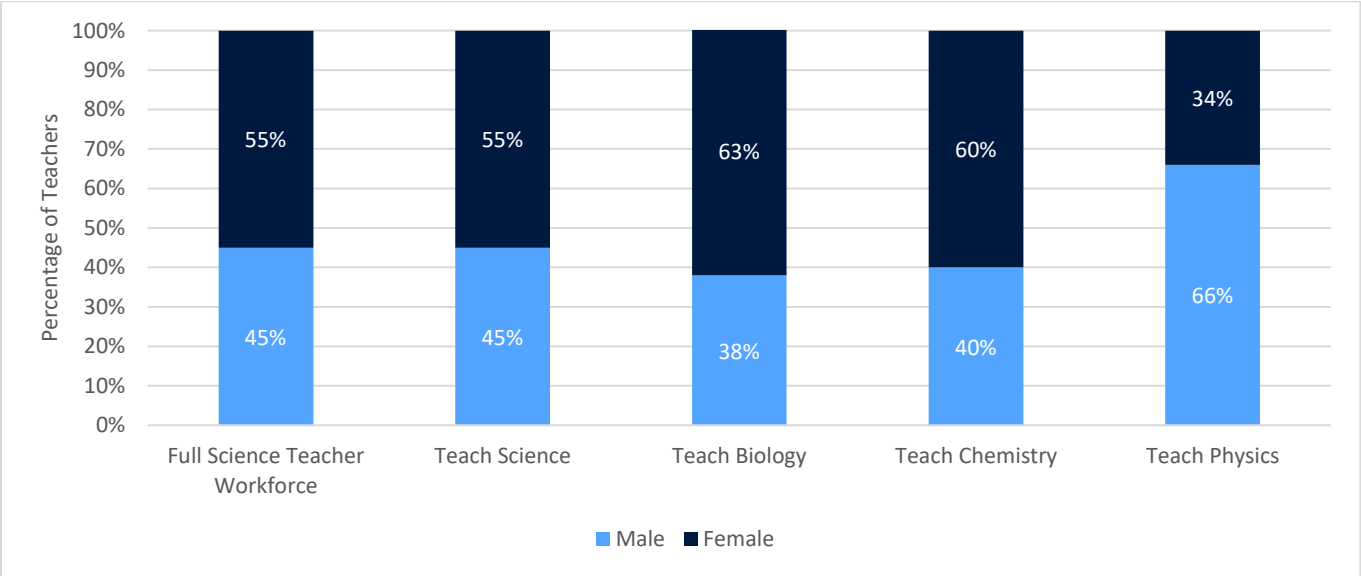
Figure 1 – Science teachers by subject



Teachers by sex

Overall, there were proportionately more female teachers (55%) than male teachers (45%) among the science teaching workforce, however, this ratio varied across individual science subjects. While female teachers made up the majority of biology (63%) and chemistry (60%), males dominated physics, accounting for 66% of the teaching workforce. These ratios are summarised in Figure 2.

Figure 2 – Science teachers by sex



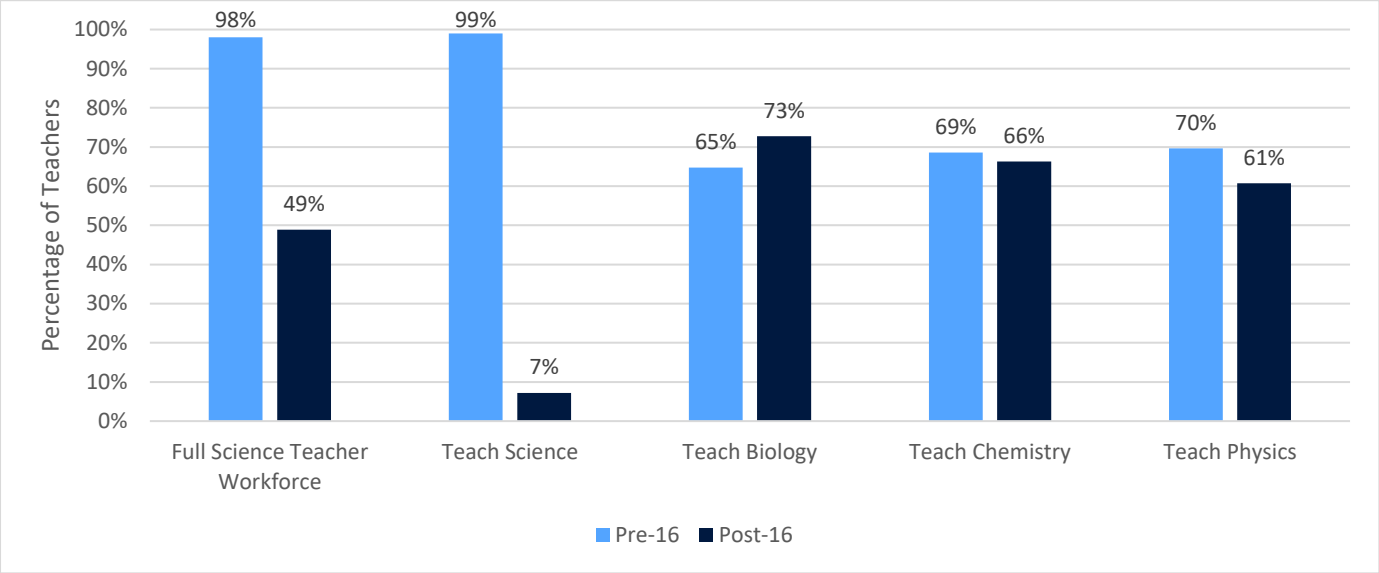
Teachers by pupil age group

Teachers also taught across pupils multiple age groups. It was apparent that while almost all teachers delivering science did so to pupils aged 11 to 16 (pre-16), just 7% of them delivered to 16-18-year-olds (post-

16). This is not surprising given that at this stage of education, science as a composite subject largely disappears and biology, chemistry, and physics are both chosen and taught as individual subjects.

Different patterns were apparent for the individual sciences. While a greater proportion of biology teachers delivered to post-16 pupils (73%) than pre-16 pupils (65%), the reverse was true for chemistry and physics. These differences are illustrated in Figure 3.

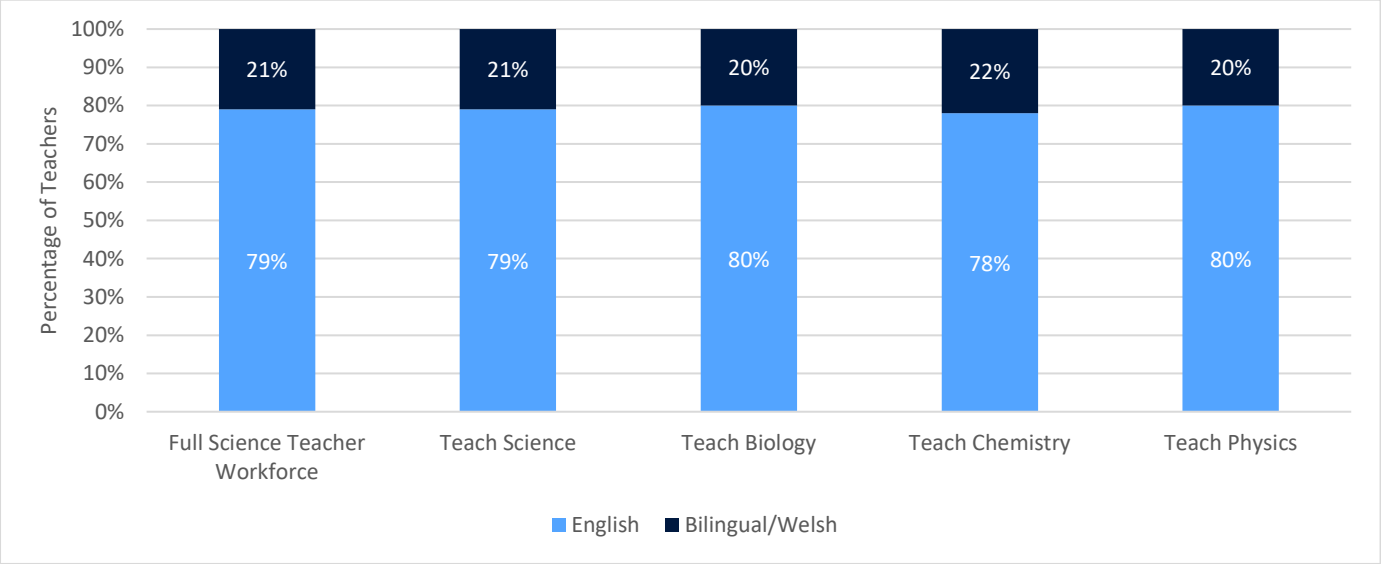
Figure 3 – Science teachers by pupil age groups



Teachers by language medium

We also explored the language medium teachers delivered their subject through. Overall, the proportion who taught in English versus those who taught in Welsh/bilingually was generally consistent across the individual science subjects, with approximately four-fifths teaching in English and one-fifth teaching bilingually or in Welsh (see Figure 4). Nonetheless, a slightly greater proportion of bilingual/Welsh teachers were apparent among the chemistry workforce, representing 22%, compared to 20% in biology and physics.

Figure 4 – Science teachers by language medium

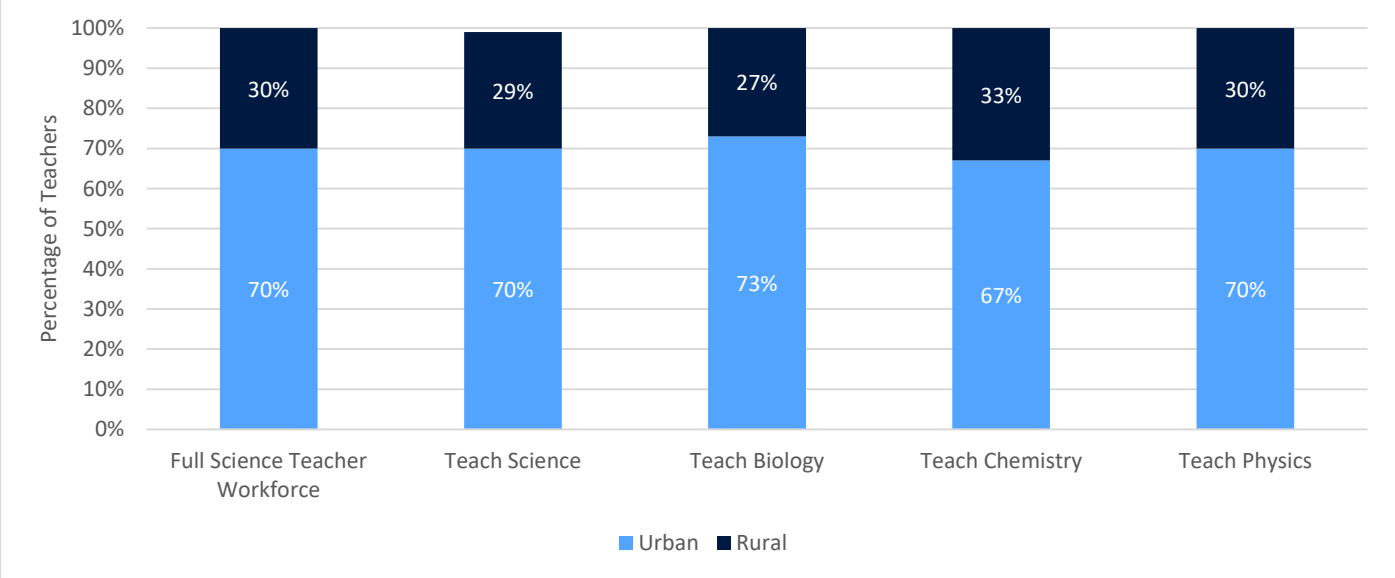


Teachers by school geography

In terms of the geography of the schools that teachers worked in, around 30% of the science teacher workforce taught in rural schools and 70% in urban schools. However, these proportions showed some variation across science, biology, chemistry, and physics.

Chemistry teachers had the highest rural presence (33%), equating to six percentage points greater than the proportion of biology teachers in rural schools (27%), which has the lowest presence. These ratios are illustrated in Figure 5 and are likely connected to the results in Figure 4. Given that the chemistry teacher workforce had the greatest proportion of bilingual/Welsh medium teachers and employment in rural schools, this may reflect the greater concentration of Welsh-medium schools in rural areas.

Figure 5 – Science teachers by school geography



Why it matters

This Data Insight provides a snapshot of the science teaching workforce in Wales. It illustrates how this workforce is represented in terms of males and females, language-medium, across education stages and across school geographies, providing a more detailed picture than what is currently available in public reports.

In particular, the gender representation of the science teaching workforce illustrates the importance of exploring workforce statistics at the subject-level. While the secondary school teaching workforce is female dominated (65% female, 35% male), this gap shrinks for the biology and chemistry workforce and even reverses in the physics workforce. The underrepresentation of female physics teachers also reflects the broader physics workforce (13) as well as pupil populations in post-16 physics which face the greatest imbalance in gender representation of the three sciences (8). For many pupils, teachers are the only point of reference and role model in science. Consequently, if their teachers are consistently male, which starkly contrasts their other teachers, this could be contributing to the ongoing challenge that many young females do not see physics as 'for them' (14).

In 2021, Welsh Government reported that approximately 25% of all teachers deliver through the medium of Welsh (and is largely unchanged as of 2024) (15), however how this presents across primary and secondary schools is not clear. This Data Insight shows that in terms of the secondary school science teacher workforce, the proportion of bilingual/Welsh medium teachers is approximately five percentage points lower.

However, the finding that chemistry teachers are proportionately more represented in Welsh-medium and rural settings compared to biology and physics teachers is notable. Previous research found that pupils in Welsh/bilingual schools have greater odds of gaining an A-C grade in AS-level chemistry than their English-medium educated peers (16). While this Data Insight does not examine pupil outcomes, the distribution of specialist teachers may warrant further exploration in relation to attainment patterns.

What next?

This analysis contributes to a more detailed understanding of the science teaching workforce in Wales, with implications for workforce planning.

Future research will explore the demographics of teachers across wider subjects, and focus on more detailed characteristics of these teachers, specifically linking with data from the Higher Education Statistics Agency to explore degree specialisms of the science teacher workforce. Further exploration will also be conducted to track the science teaching workforce over time, and how the characteristics and distribution of this workforce may have evolved.

By continuing to make use of linked administrative data, ADR Wales can contribute to a stronger evidence base to inform science workforce planning and support equitable access to high-quality science education across Wales.

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This Data Insight has been produced by the ADR Wales Education research team. It provides a snapshot of informative research currently underway at ADR Wales but is not intended to provide a complete picture of work undertaken within this field or the ADR Wales programme of work. The information presented in this Data Insight has been reviewed by ADR Wales colleagues with expertise within this thematic area and accepted to be accurate at the point of publication. Views expressed in this Data Insight are those of the researchers and not necessarily those of ADR Wales partner organisations.

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