social sciences

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"Science Is Important, but Why?" Primary-Age Children's Lack of Understanding of Why We Study STEM and the Nature of Science Careers

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Abstract

Despite persistent concerns about STEM workforce shortages in the UK, efforts to promote science study and careers have had limited success in translating into aspirations among young people. It is common for young people in Western industrialised societies to be told that it is important that they study science, but the impact of such messaging, particularly among younger children, is poorly understood. Our study asks whether pupils have absorbed the concept that science is important, why they think this is the case, and what knowledge they have of the careers that may follow from science study. Data was collected via interviews and surveys with 255 young people aged 10–11 in the North West of England. A large majority of our cohort agreed that it was important and useful to study science. However, any understanding of why this might be was superficial and circular; science matters to pass exams, gain qualifications, or become a science teacher, rather than being linked to diverse STEM careers, innovation or real-world applications. Pupils' knowledge of science careers was narrow and stereotypical, dominated by the generic term "scientist", medical jobs, and a handful of other roles such as astronaut or palaeontologist. Few participants recognised the breadth of science careers outside of roles encountered in daily life or those prominent in the media. These results highlight a disconnect between superficially positive attitudes and a shallow comprehension which fails to connect school science with potential career paths. Our analysis suggests that this mismatch is likely to impact low-SES groups more severely, thus threatening efforts to improve equity in the STEM workforce. We suggest a number of potential contributing factors, and propose a series of recommendations to tackle this deficit, including introducing more careers-relevant content and access to role models into primary school science lessons.

Keywords: primary education; science education; STEM aspirations; science careers; science capital; widening participation

Academic Editor: David F. J. Campbell

Received: 16 January 2026
Revised: 10 February 2026
Accepted: 18 February 2026
Published: 2 March 2026

1. Introduction

Concern over shortages of scientists in Western economies is a persistent issue. As technology and scientific advancements occur at a rapid pace, the need for a highly skilled science, technology, engineering, and mathematics (STEM) workforce has also increased. However, many Western governments have reported difficulties in recruiting and retaining sufficient numbers of scientists to meet the demands of the modern economy (CEDEFOP 2018; Department for Education 2024; Olson and Riordan 2012). Concerns about long-term ability to innovate and compete in the global market have led governments and

other influential bodies in developed economies to impress upon their populations the importance of science study, in the hope of encouraging greater take-up of such careers (Department for Education 2015; Department of Education, Skills and Employment 2015).

The UK has experienced this public discourse since the mid-20th century. An early and influential document was the Dainton Report (1968) which documented a "swing against science", a dramatic fall in the proportion of young people in what was then known as the "science stream" (Walsh 1968) during the 1960s. Shortages of STEM graduates, and the problem of encouraging young people to study science, have been the focus of many reports and reviews over the years (Department for Business, Energy & Industrial Strategy 2017; Roberts 2002; Smithers et al. 2009; STEM Learning 2018).

This worry, together with rapid technological advancements, means that ideas about the importance of science study and shortages of trained scientists are long-established and well-embedded in the public consciousness. This phenomenon was also bolstered by increased efforts to encourage the science community to engage with the wider public. In the 1980s, the Royal Society stated that "better public understanding of science can be a major element in promoting national prosperity, in raising the quality of public and private decision-making and in enriching the life of the individual" (Bodmer 1985). While part of this drive was about individual choice—for example, understanding what science has to say about optimal human diet—there was also an element of ensuring "the availability of adequately trained and skilled scientific and technological manpower". Since this time there has been a rise in events aimed at engaging the public with science, including a rapid growth in science festival production and attendance (Canovan 2019).

The result of this activity is that young children are frequently told how important it is that they study science. The English National Curriculum (Department for Education 2015) states that "Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects." The importance of science as a subject receives messaging that other curriculum areas do not; for example, while literacy has World Book *Day*[1], many schools take part in British Science *Week*[2].

The evidence on how effective these efforts have been mixed; although the UK's STEM workforce grew by 22% between 2013 and 2023 (Cambridge Industrial Innovation Policy 2025), significant skill shortages are still reported in a number of key sectors. In addition, women and those from low socio-economic backgrounds continue to be underrepresented (Department for Science, Innovation and Technology 2025; Greaves and Brawley 2025). This is an issue, because if the UK is to develop its workforce to meet these shortages, it will need to look outside of the more affluent groups with high science capital who dominate the current landscape. This is true from a practical perspective—broadening the pool that we draw our scientists from can only help with recruitment—but also for reasons of equity; STEM jobs are often well-paid, high-status, interesting and fulfilling, and such opportunities should not be restricted to certain social groups or regions.

In order to understand how public messages of the importance of science are likely to impact the STEM workforce in the future, it is helpful to look at young people's attitudes to science careers. If the message that governments are trying to project—that science study can lead to well-paid, interesting jobs that will benefit the economy—has been received and understood by this group, explanations for persistent shortages and underrepresentation of certain groups will need to be sought elsewhere. However, if the message has not been delivered, promoters of science education may need to consider a different approach.

Whether these efforts have led school-age children to understand more about science careers and what scientists do is a question that has not been widely studied. While a number of studies have looked at ideas about science jobs among older students, particularly those aged 14+, little focused work has been done to understand the views of younger

groups, including those of primary school age (11 and under). This is an issue, because research suggests that attitudes towards science careers begin to become fixed from the age of 10 (Archer et al. 2013), and so understanding their formation among younger age groups is of primary importance.

What work there has been among younger pupils gives mixed evidence as to views about how likely they are to pursue science careers. The major study specific to science, ASPIRES 1 (Archer et al. 2013), found that "very few young people (approximately 15 percent) aspire to become a scientist. This aspiration remains consistently low across the 10–14 age range." However, more generalised research looking at careers seems to show a shift in attitudes over time, with science careers becoming more popular (Education and Employers 2018; Hutchings 1996). Results were also mixed when it comes to addressing the underrepresentation of low-SES groups and whether attitudes differ across the socioeconomic spectrum.

More work is clearly needed to understand attitudes to science careers among primary-age pupils in the UK, and this paper attempts to contribute to this effort. Education is a fully devolved matter in the UK, meaning that each of the four nations—England, Scotland, Wales, and Northern Ireland—determine their own education policy. While some of the references in the discussion surrounding this study talk about the UK as a whole, in this paper we concentrate on the situation in England.

Education in England is governed by the National Curriculum, which outlines a statutory programme of study for all state-maintained schools, in four key stages. Science is compulsory at all four stages, starting in Year 1 (age 5–6) with simple tests and equipment, running through to national exams at 16 where everyone studies for a minimum of two GCSE qualifications. In this paper we focus on pupils in Year 6 (aged 10–11), the last year of primary school, where science study covers topics such as the human body, animals and habitats, evolution, and light. We investigate the attitudes to, and understanding of, science careers among a group of children aged 10–11 in North West region. While the region as a whole is not the country's most deprived (Leach 2022), and has seen recent gains in productivity (Office for National Statistics 2023), there are pockets of extreme deprivation, particularly in Blackpool, which was the focus of the first phase of the study and is home to seven of the 10 most deprived areas in England (English Indices of Deprivation 2025). Our full study cohort, although drawn from a variety of schools with a range of catchment areas, is mainly from areas of higher deprivation, including some of the schools with the highest levels of free school meals in the country. The views of these young people are therefore helpful in understanding the equity issues that arise from an understanding, or otherwise, of the utility of science careers, as well as giving an insight into the views of young people generally.

2. Literature Review

As noted in the Introduction, young people have been exposed to many messages over recent decades about the importance of science. This study asks what impact this messaging has had on primary-age pupils' ideas about the importance of science study, and what science careers are available. We begin by reviewing the limited existing literature on this point, as well as that about the views of older children. We then consider different models of how career decisions are made during childhood and adolescence, which may inform us about how attitudes and information about science careers may influence decisions to pursue these paths.

2.1. Attitudes of Primary-Age Pupils

In the UK, the most prominent source of knowledge about primary children's attitudes to science specifically is the first stage of the ASPIRES project (Archer et al. 2013). Of particular relevance is a study by DeWitt et al. (2013) who analysed the results of the first ASPIRES survey, administered to more than 9000 pupils aged 10–11. The authors note that "previous research has found that students hold a perception of science as important and valued but nonetheless "not for them"... Such perceptions are likely to be exacerbated by students' lack of understanding about what science careers actually involve." Analysing the survey data, the authors found the following:

... even though 40% of students agreed that they would like to study more science in the future, 29% would "like to have a job that uses science" and 31% even think they would be capable of being good scientists, only 17% agreed that they would like to "become a scientist"...

In other words, children are unable to see themselves becoming a "scientist", although many are interested in engaging in science.

Findings from other countries suggest that there is work to do to improve attitudes and knowledge among younger children in the UK in comparison to other economies. For example, Turkish 9–11 year olds who were asked what kind of work scientists do answered that "they develop technology, design projects, do research, make inventions, use technology, work in a laboratory, produce devices that make our lives easier, and are clever and inventors" (Pekmez 2018). A study of Pakistani pupils with a mean age of 12.8 found that they had a highly positive attitude towards their future participation in science (Anwar and Bhutta 2014). Finally, a study of pupils with a wide range of ages in South Korea found that 21% wished to pursue a science career, although the lowest percentage was seen among middle school students, and that they saw the advantages of a science career as being "useful for national development... [and] possible to get new knowledge" (Yoon et al. 2006).

Although little previous work has been done specifically looking at views on science careers among younger children in the UK, we can draw on more general careers-based research among this age group for guidance. It is particularly interesting to compare the career aspirations of primary-age pupils across the last two decades, a period in which the importance of science has been the focus of the concerted messaging outlined above.

Hutchings, whose work dates from 1996, conducted interviews with children aged 4–11 from two schools of different SES catchments (Hutchings 1996). Pupils were asked what work they thought they might do as adults. At this point the term "scientist" was not mentioned by any participant, although the related career of "engineer/mechanic" was cited by two boys from the lower-SES catchment school. By contrast, the "Drawing the Future" study, conducted in 2017, found that "scientist" was one of the most popular choices (Education and Employers 2018). The international research, which asked pupils aged 7–11 to draw what they wanted to be when they were older, included results from more than 13,000 children in the UK and Channel Islands and found that in this region "scientist" was the 7th most frequently cited job, with "engineer" in 11th, with boys naming these options more frequently. Moreover, while engineering roles were more commonly mentioned by boys attending schools in more affluent areas, the popularity of scientist as a job was not apparently impacted by SES.

These findings, in combination, might give one pause. If the popularity of science as a job has rocketed among children over recent years, and if this popularity is not limited to more affluent groups, should we not be beginning to see an impact in the workforce? But skills shortages remain, and it is certainly the case that low-SES groups continue to be underrepresented in the STEM workforce. It therefore seems possible that public

messaging about the importance of science is not having the desired effect, at least among some target groups.

2.2. Views of Older Age Groups in the UK

There is more depth to the UK literature when it comes to perceptions of science careers among older age groups, particularly 14+ (e.g., Rodrigues et al. 2011; Taber et al. 2021). However, even among these pupils, who are further along their educational careers, there is often a lack of awareness of career options within science. A review of the literature by White and Harrison (2012) notes that "It is widely viewed that students are unaware of the full range of careers that science has to offer. . . they had misapprehensions and lacked a full understanding about such careers." Cleaves, who studied the formation of science choices among higher-achieving pupils during the ages 13–16, found that pupils who chose to continue studying science "were distinguished by their deeper appreciation of what one might expect in a science career" while others "thought that science teaching seemed to be limited to preparing students for a research career in science at the university level" (Cleaves 2005).

The limited range of knowledge about science careers among pupils aged 14–18 was discussed in a report to the Wellcome Trust (National Foundation for Educational Research 2011). Researchers found that although most pupils would consider a career in science, "many were not yet entirely certain which specific job they would like to do," and expressed the view that they did not have sufficient information about science careers. When participants were asked to name a science career, the choices cited did not display a great deal of breadth. The most popular option was medicine, while other medical-related jobs such as pharmacy and nursing made up a third of all those suggested. Other careers mentioned including those which were animal-related (zoo keeper, marine biologist), teaching (science teacher, PE teacher), and trades (electrician, welder).

This discussion suggests that while the UK, in common with many other developed economies, has pursued a long-term agenda of actively promoting science participation with the message that we need more STEM workers, Britons of secondary school age do not have a clear grasp of the range of science careers, while there is little evidence on this point about the views and knowledge of younger age groups.

2.3. Theories of Career Choice

In order to understand how young people's knowledge and understanding of science study and careers may influence their progression to jobs in the sector, we first need to understand the process by which such decisions are made. Career choice theory has been the focus of much study and debate since the mid-20th century. There are a number of schools of thought; here we briefly consider three which may be of relevance.

2.3.1. Trait-Factor Theory

The work of Holland (1972) focuses on career choice as a matching process between the traits of the individual and the characteristics of different career environments. The author identifies six types of occupational environment and posits that an individual's interests and personality lead them towards one of these environments. Holland states that a person's "interest inventory profile" is "as deep or fundamental as the relationship the person had with his parents or siblings". Holland later claimed that "Studies show that people flourish in their work environment when there is a good fit between their personality type and the characteristics of the environment" (Holland 1996).

2.3.2. Developmental Theory

Ginzberg (1952) was a pioneer of developmental ideas of occupational choice, arguing that such choices were a process which were largely irreversible. He describes "periods" in the development of a child's choices, as "fantasy" before age 11, "tentative" in the teenage years, and "realistic" from 17 into adulthood. Later commentators have argued that this translation from fantasy to realism is mediated by factors such as SES and ethnicity; Howell et al. (1977), for example, found that SES had "a significant direct impact on senior occupational expectations".

Super (1980) proposes a "rainbow" model expressed in two dimensions—temporal, or "life-span", and contextual, or "life-space". His writings go on to propose a number of career stages, the first of which is "growth", spanning the ages of approximately 0–14 (Hartung 2013). In this stage, the child develops their vocational self-concept through curiosity (0–4), fantasies (4–7), interests (7–11), and capacities (11–14) to construct their ideas of a potential future self. Hartung notes that "Children must. . . construct a viable work future consistent with cultural imperatives conveyed in family and community contexts. . . A critical element in this process is envisioning oneself in work and other roles".

A developmental theorist who includes more social factors in their thinking is Gottfredson, whose theory of circumscription and compromise (Gottfredson 2002), argues that as young people develop both their self-concept and their images of different occupations, they progressively narrow the potential zone of career alternatives to which they aspire. The acquisition of abstract notions such as gender and social class leads them to progressively rule out an ever-growing range of jobs as incompatible. Gottfredson notes that perceptions—whether accurate or not—are used to position young people within the social world, and their reliability or otherwise can impact on the goodness of fit between individual and career.

2.3.3. Social–Cognitive Theory

Lent et al. (1994) use a social–cognitive framework to centre personal agency in the process of career development, together with the factors that impact that agency. Their Social Cognitive Career Theory (SCCT) situates self-efficacy as a key influencing factor, together with the individual's expectations and goals; these factors are dependent on ability to an extent, but also on personality and context. Factors such as gender and ethnicity and the differential learning experiences and societal expectations that they can imply, act to mediate career choice.

2.3.4. A Bourdieusian View of Career Development

The work of the renowned sociologist Pierre Bourdieu can also yield some insight, particularly via the concept of *habitus*, the ingrained dispositions, habits and ways of thinking that individuals acquire through socialisation. Hodkinson and Sparkes (1997) harness Bourdieu's thinking to argue that career decisions are taken within "horizons for action"—the arena that limits potential actions and decisions—which are partly prescribed by habitus, together with structural labour market conditions. The authors note that "Horizons for action are segmented, in that no-one considers the whole range of possible opportunities in education or the labour market," with segmentation driven by factors such as social class, gender and ethnicity. The connected concept of *capital* is also invoked, with, for example, parental contacts providing an additional facilitator of entry or otherwise into certain fields.

Support for this view, and Bourdieu's theory that social inequalities are passed across generations by cultural reproduction (Bourdieu and Passeron 1990), is seen in a number of studies demonstrating that children are disproportionately likely to enter the same career

sector as their parents. A recent study estimated that graduates are "two to five times as likely to hold a degree in the field that their parents graduated from," (Altmejd 2024). Some studies found that this effect was stronger for transmission between fathers and sons (Dryler 1998), although one study focused on engineering found that maternal career was particularly salient for daughters' career trajectories (Jacobs et al. 2017). A 2002 study found that in the UK, around 10% of graduates were in the same occupation as their father (Chevalier 2002). When it comes to STEM careers, Cheng et al. (2019) find that both sexes are more likely to end up working in a STEM field if one of their parents does so, although this affects boys' aspirations at a younger age.

It is important to note that other careers theorists have pushed back against the notion that socialisation can provide the entire explanation for such effects; Gottfredson points out that genetic factors are also at play here, stating that "We help to create our own environments and experiences—and hence our selves—based on our genetic tendencies," and promotes a nature–nurture partnership model whereby the influence of cultural factors is modulated by personality and ability.

The Bourdieusian view finds some support in the career choice literature mentioned in earlier sections. Both Education and Employers and Hutchings (Education and Employers 2018; Hutchings 1996) found that close familial contacts—parents, siblings, extended family—were vital in forming career preferences. Where the participant did not know someone with a job, they were influenced by media and people who they had encountered during their daily lives. It therefore follows that where an occupation is heavily segregated by social class, as is currently the case with professional STEM roles, this inequality is likely to be perpetuated unless it is highly visible in everyday life. Most people encounter medical professionals such as doctors and nurses from a young age, and it is striking that these professions are among the most popular; but "scientists" are much less frequently encountered. It is therefore likely that family-based encounters assume an outsized importance in the question of who aspires to a science career.

3. Research Questions

The above discussion suggests that there is a need to expand our knowledge of younger children's understanding of and attitudes towards science careers, as the literature for the UK is currently limited. Information gathered on this point can then be used in conjunction with established theories of career development to suggest how these attitudes may impact on future progression to the STEM workforce. Our review therefore leads us to pose the following questions:

1. To what extent do primary-age children believe that it is important for them to study science?
2. What is their understanding as to *why* the study of science is important?
3. How much information do these children have about the range of available jobs which use science?
4. What do these attitudes have to tell us about persistent shortages and inequalities in the STEM workforce?

The first three questions are addressed in the Results section, and the fourth in the Discussion.

4. Materials and Methods

The data for this study were collected in two stages over a period of around 18 months, using a mixture of interviews and surveys. The first stage of data collection was in early 2018 and was associated with the PIER (Physics: Inspire, Engage, Research) project, a longitudinal programme aimed at increasing awareness of space science. The PIER programme was conducted with whole primary school classes in schools in Blackpool, one of the most

deprived areas of the UK. The participating schools were among those with the highest levels of pupil premium[3] in England in the year PIER started, with all in the top 2%. Young people aged 10–11 from three schools who were about to join the programme took part in a series of brief one-to-one interviews with researchers looking at their attitudes towards, and experience of, science. In total 48 interviews were conducted, of which 46 answered questions relevant to the current study; where gender was recorded, 38% were male. Consent was gathered from all participants and their parents and participating in PIER was not contingent on taking part in research. Pupils were invited to choose a pseudonym to be used if they were quoted.

The interesting results arising from these interviews prompted a second stage of data collection in order to expand the pool of participants and allow triangulation across data collection methods. In this stage, which took place across the summers of 2018 and 2019, we surveyed pupils whose schools were planning a visit to the Lancashire Science Festival (LSF), a free annual event focused on enthusing primary-age children about science. Before they attended the festival, a total of 207 young people aged 9–11 from 11 schools in Preston, Blackburn and surrounding areas completed an online questionnaire. The survey schools were more representative of England as a whole, with three being in very affluent areas and a further three broadly in the middle of the SES distribution; however, the sample as a whole still skewed towards areas with high levels of deprivation. Of those who specified a gender, 99 were boys and 105 girls.

Qualitative data for this study were analysed using inductive thematic analysis, following the six-phase reflexive approach outlined by Braun and Clarke (2006). In this methodology, the researcher first of all familiarises themselves with the data (phase 1) by reading and re-reading multiple times in order to become deeply immersed. Initial codes are then identified (phase 2), in our case via manual highlighting, and collated into a preliminary framework. Codes are then grouped into potential themes (phase 3) with all data relevant to each theme gathered. Themes are then reviewed to ensure they fit with the data (phase 4) and are defined and named (phase 5) before being related back to the data in order to produce the final analysis (phase 6). An inductive approach was indicated because very little work has been done in this area in the past, and therefore the researchers had no pre-existing theoretical framework to impose upon the data. The themes are therefore allowed to emerge from the data in a way that allows the research questions to develop in tandem.

5. Results

5.1. To What Extent Do Primary-Age Children Believe That It Is Important for Them to Study Science?

We asked our cohort a number of questions related to this theme. Our interview group were asked "Do you think it is useful to study science?" The answer was overwhelmingly yes, with 40/47 (85%) agreeing.

Our survey group was asked how much they agreed with the statement "It is important for me to be good at science". Of 202 responses to this question, 77 strongly agreed and 73 agreed, making a total of 150 (74%) agreeing, which corresponds with our interview findings. We also asked our survey group how much they agreed with the statement "It is useful to know about science in my daily life". Out of 205 responses 146 (strongly) agreed, or 71%. All three statistics indicate that the majority of older primary school pupils believe that the study of science is useful and important for them. Our data echoes the findings of the first ASPIRES report (Archer et al. 2013), in which the vast majority of participants agreed that they learned interesting things in science, and that scientists "make a difference

in world"; as the report notes, "There is a striking gap between students' positive views of science and their lack of interest in science careers," which our study aims to shed light on.

5.2. What Is This Group's Understanding as to Why the Study of Science Is Important?

Although our participants strongly expressed that studying science was important for them, our interview responses suggest that children of this age may not understand *why* such study is useful.

When asked to expand upon why it is useful to study science, participants displayed a high level of circular thinking. For example, they held that it was important to study science because that might lead to a science qualification:

> You can get a good few grades and GCSEs for it. ["Jake Charlie Miller", Female, School 1]

> Yes because you will have science tests and SATs and exams so will need to learn about all different things to pass those tests. ["McKenziee", Female, School 2]

Others suggested that it was useful to study science because then you would know about science:

> Yes because children can learn more about science and know more about science. ["Jade", Female, School 2]

> Studying science is really good because you can learn more in science than your brain, you can keep all the information in your brain that can go to the words. ["Bandana", Male, School 2]

Respondents also thought that knowing about science might be useful because you might become a science teacher:

> If you want to be a science teacher [you] would have to know quite a lot about science. ["McKenziee", Female, School 2]

> Yes because say [you become] a teacher, you have to know science to teach it. ["Tom", Male, School 3]

And finally, it is useful to study science because someone might ask you a science question.

> Yes because you might come across someone who can ask you questions about science and you would be able to answer. ["Ariana Grande", Female, School 2]

> If you are doing it at home, doing science, if you come into school and they ask science questions you can answer. ["Louise", Female, School 3]

As far as the authors are aware, this phenomenon of children using circular thinking to try to explain the importance of science, in the absence of any real understanding, has not previously been highlighted.

5.3. How Much Information Do Primary-Age Children Have About the Range of Available Jobs Which Use Science?

We asked both our interviewees and our survey respondent to name one or more science jobs. The categories of jobs suggested by the two groups were broadly similar, other than the fact that our interview group was about to embark on a programme of space science activities, meaning it clearly had more prominence in their minds.

The main categories mentioned by pupils were as follows:

- Medical jobs

Space aside, medical roles were the most frequently cited by both groups. "Doctor" was given particular prominence by our survey group, suggested by 43/207 respondents, but pharmacist, surgeon, dentist, nurse and vet were also represented.

- "Scientist"

Another very common response was the simple description "scientist", named by 59/207 survey respondents and also frequently cited by interviewees.

- Non-science jobs

Familiar jobs which would not normally be thought of as "jobs in science" were cited frequently by both groups; examples included trade jobs such as mechanic, electrician and builder, as well as emergency services roles such as police officer or firefighter. Interestingly, some attempts were made by interviewees to explain how these jobs involve science: one respondent said "A builder, [because] if you're mixing chemicals, you need to make solids," while another described how a police officer might use the direction of the sun to discover which way a criminal had gone.

- Space science

As mentioned, these roles had particular prominence in our interview group, but were also a significant feature in survey responses. However, many of the descriptions of such jobs were quite basic, such as "rockets", "astronaut" and "NASA", although there were some uses of the more technical term "astronomer".

Other than the above categories, commonly named individual jobs included "engineer" and "teacher" or "science teacher". Among the larger survey pool there were a tranche who named jobs which echoed school science—physicist, chemist[4], biologist; although our cohort were primary-age pupils, they may have an awareness of these disciplines from older siblings or high school open evenings. A few other technical names for scientific disciplines were recorded, with the most prominent being archaeologist/palaeontologist. Table 1 gives a summary of the most common categories.

Table 1. Most common career categories cited by our participants.

Career Category	Further Information	% Survey Participants	% Interview Participants
Medical	e.g., doctor, pharmacist, dentist	31%	26%
Scientist		29%	17%
Non-science jobs	e.g., electrician, mechanic, police officer, firefighter	15%	22%
Chemist/chemistry		13%	9%
Archaeology/palaeontology		12%	7%
Engineer/engineering		10%	2%
Space science	e.g., astronaut, astronomer	10%	35%
Teacher/science teacher		9%	13%
Blank/don't know		5%	22%

These results are strikingly similar to those in the Wellcome Trust data gathered from older pupils aged 14–18 (National Foundation for Educational Research 2011), which also reported that medical roles made up one-third of all "science jobs" cited. Whilst it is unsurprising that a fairly rudimentary knowledge of science careers in an older age group implies a similar picture for younger children, it is useful to add to the small pool of knowledge about this age group's images of science careers.

6. Discussion

6.1. Lack of Understanding of Why Studying Science Is Important

Primary school children have clearly taken messages surrounding the importance of science to heart, with a large majority of our cohort agreeing that it is useful to study science, it is important for them personally to be good at science, and that it is useful to know about science in their daily lives. This makes sense in the context of our finding, drawn from comparing the literature over time (Education and Employers 2018; Hutchings 1996), that the popularity of "scientist" as a career has grown markedly over the past two decades, demonstrating the positive attitudes underlying this shift.

However, the messaging has had a shallow impact, with children unable to articulate why this should be; our results suggest that the breadth of science-related careers remains largely invisible to primary pupils. This in turn has implications for the STEM pipeline; while positive attitudes towards science jobs appear to be widespread among our cohort, children are in fact failing to connect school science to meaningful future roles.

We have identified three potential reasons for this disconnect between the stated belief that science is important and an inability to explain why:

1. Learning for Learning's Sake.

Our cohort's responses to the question of why the study of science is important displays a high degree of circular reasoning; you should learn science in order to be good at science, to pass science exams, to become a science teacher, or because someone might ask you a question about science. This emphasis on passing exams, "doing well at school" or other forms of assessment suggests that the science curriculum is more focused towards achieving qualifications and getting good grades than it is on informing pupils about potential future careers in the field.

2. Overly literal views of the idea that "science is everywhere".

Our group also displayed a significant degree of confusion between "jobs that use science" and "science jobs"; in lieu of being able to name what would typically be thought of as a "science job" by those in the sector, children found ways to describe everyday roles (mechanic, builder, police) as involving the application of science. This tendency was also visible among older age groups in previous studies, with mentions of jobs such as trades and "pilot" cited as being science-related (National Foundation for Educational Research 2011). This phenomenon is suggestive of an over-interpretation of the trope that "science is all around us", common in content for young people such as books (e.g., Liu 2024) and on YouTube (e.g., Kids POP Songs 2025). Whilst this concept has an important part to play in enabling children to understand the context for the science they learn, and helps to engage their natural curiosity, the idea that "every job is a science job" is not helpful for the drive to increase the core scientific workforce. If young people who respond positively to the suggestion that they could pursue a scientific career also think they can do this by, for example, becoming a firefighter, they potentially remove themselves from the pool of those who could go on to work in shortage sectors such as engineering and advanced manufacturing (Cambridge Industrial Innovation Policy 2024).

3. "People-pleasing" tendencies.

It seems quite possible that in stating that science is important, children are largely telling adults what they want to hear; school pupils are told frequently that "science is important" but our participants clearly did not understand why. Nevertheless, they strongly agreed with the statement. It is plausible that they have learned to parrot this response for reasons of conformity and because they believe that this is what adults in positions of authority appear to want to hear (Rigby 1987; Smetana and Bitz 1996).

6.2. Narrow and Stereotypical Views of Science Careers

Our participants' knowledge of science jobs was both caricatured and limited; a science career means being something known as a "scientist", or a few other roles such as doctor, astronaut or teacher. Here we should consider the role that informal and out-of-school learning has to play; the noticeable slant of the jobs cited by our cohort towards medicine and space is likely at least partly due to the prevalence of such roles in media (Gehrau et al. 2016). Pupils may have been exposed to doctors in TV shows such as Scrubs, or rocket launches by operations such as SpaceX on social media. Whilst such outputs certainly feature science-relevant careers, they are not strongly aligned with the labour-market reality of science shortage sectors, and it appears that the formal school curriculum is not effectively countering such impressions. Again, this chimes with similar findings related to older school children (National Foundation for Educational Research 2011).

6.3. Implications for Progression to the STEM Workforce

We have seen that young people's superficial claims to see the study of science as important are not grounded in any solid understanding of why this might be, and that furthermore their knowledge of what a science career might be or entail is limited and stereotypical. What can career choice theory tell us about how these findings may impact on pupils' chances of progressing to STEM careers, and about persistent shortages and inequalities in the STEM workforce?

Whatever model of career choice is preferred, a lack of understanding of any career mitigates against it being pursued. If career selection is seen as a matching process between traits and job characteristics, as in Holland's vision (Holland 1972), then not understanding the job characteristics will leave the young person unable to assess their fit; as Gottfredson comments, "When perceptions are inaccurate, fit may be impeded" (Gottfredson 2002).

From a developmental perspective, there is also an issue; as Super (1980) notes, envisioning oneself in a work role is critical in the construction of a viable work future. Lack of understanding of such a role will inevitably hinder this process. For social-cognitive theories, the picture is just as clear; if young people are unable to envisage what a career in science might involve, they are also unlikely to develop the self-efficacy in relation to such a career that Lent et al. (1994) describes as key.

All of these theories suggest that a lack of information and understanding about the nature of science careers could be detrimental to efforts to grow the workforce, whichever model is preferred. These findings are somewhat dispiriting in the context of the extensive national effort to build the scientific workforce. When the science establishment promotes the message that "science is important", this is rooted in the belief that scientific endeavour is a motor for economic prosperity, and in some cases, in the belief that science careers, lucrative and rewarding as they can be, should be open to all groups in society. However, the thinking behind the statement does not seem to be filtering through to many or even most children.

Our results for 10–11 year olds add context to findings by others (White and Harrison 2012) that older pupils at secondary school still do not have a clear grasp of the breadth of science careers. Understanding the limitations of the younger age group's understanding of why we study science and STEM careers is important, because attitudes to science and whether it is "for me" begin to become fixed from the age of 10 (Archer et al. 2013); our findings support the ASPIRES report's suggestion that a lack of understanding about what science careers involve may contribute to a perception of science as "not for me". Tackling a lack of science career knowledge at secondary level may, therefore, be too late. If we wish young people to be able to see themselves as having a future in STEM, we need to show

them how this could happen at a young age, before their view of science as "not for me" becomes too embedded to change.

6.4. Implications for Widening Science Participation and Equity

By considering our findings from a Bourdieusian standpoint, we can see that existing levels of knowledge and attitudes regarding science careers are likely to particularly disadvantage pupils from SES backgrounds. Our cohort was disproportionately drawn from schools in areas with high levels of deprivation. As the distribution of those currently working in STEM careers is skewed towards those from affluent backgrounds, these pupils may be less likely to have "scientists" in their familial circles. Children who have no first-hand knowledge of adults working in science may struggle to describe relevant careers beyond the everyday trades and emergency services jobs they know from family or day-to-day experience. If we do not give then access to this information in an educational setting, then their "horizon for action", as described by Hodkinson and Sparkes (1997), will necessarily remain limited by an inability to envision themselves in STEM careers. By contrast, young people whose circles *do* include knowledge of scientific roles will better understand the breadth of science careers, and we know that those who do have such a grasp are more likely to make choices that facilitated their progression to science sector jobs (Cleaves 2005), perpetuating stratification in who can access science careers.

6.5. Harnessing the Curriculum to Tackle These Issues

If we are to broaden pupils' visions of science careers beyond limited stereotypes such as "doctor", "astronaut" and the catch-all "scientist", we need to look to the curriculum. Primary programmes that focus on depicting space explorers, or generic lab-coat researchers, are actively reinforcing the narrow stereotypes we want to break, as well as taking up time that could be devoted to examining the breadth of the science sector. An emphasis on passing exams rather than preparation for the real world encourages circular thinking that science study is purely to be good at science.

The primary science curriculum as it stands (Department for Education 2015) does not contain any explicit careers content, and government guidance on careers provision generally only relates to children at secondary school from year 7 (Department for Education 2025). In addition, whilst year 6 pupils are encouraged to find out about the lives and work of scientists such as Mary Anning and Carl Linnaeus, there is no suggestion that the work of contemporary scientists might also be studied.

It is, however, the case that there are resources available to teachers who would like to include more careers information in the classroom. For example, the Primary Science Teaching Trust provides videos of scientists in their workplace under the banner "A scientist just like me," (Primary Science Teaching Trust 2021) while the "I'm a scientist, get me out of here" programme allows pupils to take part in text-based chats with working scientists (I'm a Scientist 2026). A diverse array of scientists are profiled in British Science Week's Smashing Stereotypes resource (British Science Association n.d.). Wider take-up of such resources may be beneficial.

In the next section, we give some pedagogical recommendations which advocate the explicit teaching of science careers from primary age, the use of suitable role models, and a reframing of "why learn this?" away from exams and towards real-world applications.

7. Conclusions and Recommendations

Young people's assertions of the importance of science might lead legislators and educators to infer that efforts to promulgate this message have been successful. However, a closer investigation reveals that pupils' statements on this point are built on the flimsiest

of foundations. Our cohort were unable to explain *why* science is important without displaying circular reasoning ("it is important to study science in order to be good at science") and had a very basic knowledge of what a science job might look like, which did not help them to understand how such careers might be attainable to them.

In order to address the challenges outlined in the previous section, we need to harness the curriculum to explore the breadth of real-world science careers and the relevance of the programme of study to these opportunities. Whilst ensuring that content is appropriate to the upper-primary age group, we can and should design content, and make better use of existing resources, that embeds careers more firmly in content delivery. This might include material that

- Shows the diversity of science roles.

Some scientists work in the lab; others work on the farm, in factories, in hospitals and in the armed forces. A simple series of posters or cards with the message "We are all scientists" could show pupils that science isn't all lab coats.

- Explains how classroom activities are related to science jobs.

Studying minibeasts? You could become a conservation ecologist. Enjoy learning about forces? Why not become an aerospace engineer, testing wing designs in a wind tunnel. Measuring temperatures? Maybe you could go on to design a new type of battery.

- Reassures children that they don't have to be a genius to work in science when they grow up.

The key message is that real-life scientists are normal people who are good at asking questions. They want to know how things work, and how to make them work better—and by doing so, they help to make the world a better place.

- Allows classes to "meet" a real-life scientist who does not conform to stereotypical depictions.

The visitors that schools are able to attract is often down to their catchment area, which can perpetuate inequalities; a school where many parents have professional roles, for example, is more likely to be able to access suitable guest speakers in these fields. A programme matching scientists with schools in less affluent areas could be one way forward; videos are an easy and cheap alternative, and many examples are already available.

By weaving some light-touch interventions of the kind outlined above into primary science curriculum delivery, we could begin to tackle the issues outlined in our findings, and direct views on the importance of STEM learning away from passing exams and towards the potential of a future career in the sector. A concerted effort along these lines could help pupils from all backgrounds to understand how they can progress to science-sector roles, thus ensuring that these rewarding and lucrative careers are not the exclusive province of the more privileged, as well as helping to boost key areas of the workforce.

Author Contributions: Conceptualization, C.C. and R.W.; Methodology, C.C.; Validation, C.C. and R.W.; Formal Analysis, C.C.; Investigation, C.C. and R.W.; Resources, C.C. and R.W.; Data Curation, C.C.; Writing—Original Draft Preparation, C.C.; Writing—Review & Editing, C.C. and R.W.; Project Administration, C.C. and R.W.; Funding Acquisition, R.W. All authors have read and agreed to the published version of the manuscript.

Funding: The research was partially funded by the Science and Technology Facilities Council (STFC) as part of a Fellowship in Public Engagement held by Walsh, Project Reference: ST/R001235/1.

Institutional Review Board Statement: Data collection for this project was approved by the PSYSOC and STEMH ethics panels of the University of Lancashire, approval numbers 422 and 811 respectively.

Informed Consent Statement: Informed consent was gained from all participants; written consent was gathered from the parents of all participants, as well as verbal consent from the pupils themselves.

Data Availability Statement: The data presented in this study are available upon request from the corresponding author. The data are not publicly available due to the age of the participants.

Conflicts of Interest: The authors have no conflicts of interest to declare.

Notes

1 https://www.worldbookday.com/.
2 https://www.britishscienceweek.org/.
3 Pupil Premium is extra funding provided by the government to help disadvantaged pupils perform better.
4 A complicating factor in British English is the dual meaning of "chemist" as either "pharmacist" or "chemical scientist"; in our analysis we have opted for the latter unless the participant specified the former, but this is a potential source of error.

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