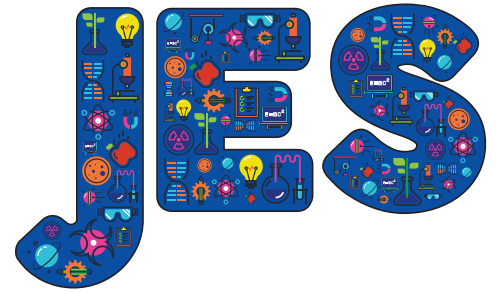


Careers education at primary



● Kate Sutton

Abstract

In this article, I explore my Masters' action research on STEM careers education. From September to December 2019, I introduced STEM careers to my Year 6 (ages 10-11) class through a range of visits, visitors and activities. Findings from pre- and post-surveys, together with class work, demonstrated improved attitudes, engagement and understanding of STEM careers. I also draw upon core reports including: Young People's Views on Science Education (Wellcome, 2017), Dream Jobs (OECD, 2020) and Drawing the Future (Chambers et al, 2018). This article highlights the positive impact of primary careers education and also the need to ensure that it is taught in a relevant, hands-on, local, informative and non-discriminatory way to be most effective.

Keywords: Careers education, STEM careers, stereotyping

Introduction

Throughout 2019/20, whilst working full time as a Year 6 teacher and Science Lead, I studied for a Masters in Education. I learned about the historically stereotypical views held regarding females in Science, Technology, Engineering and Maths (STEM) roles and the STEM skills gap, with the 'low take-up of STEM careers due to a decline in interest in these subjects during education, particularly by girls' (RAEng, 2017). I developed an understanding regarding possible future effects of evolving IT; misconceptions regarding academic challenges in science plus social and cultural capital; and social mobility, having particular pertinence to me due to working in an area with low socio-economic status. Transition to Year 7

(ages 11-12) was also part of my Year 6 role and negative effect on the take-up of STEM subjects in secondary school was a clear interest. The Careers Strategy (UK Gov, 2017) and Industrial Strategy (UK Gov, 2017) were developed to address this gap.

I felt dismayed by the seeming lack of social justice mindset and Equity Compass (Archer, 2020) as pupils went through national testing in our education system. In addition, the National Curriculum in England and lack of Key Stage 2 (ages 7-11) links to careers information were also highlighted. At secondary level, the Gatsby Benchmarks (2017) had been introduced but, at Key Stage 2, the issue was not being addressed. Unaware of other initiatives/professionals in this field, I decided to base my research project and dissertation on this subject.

My aim was to investigate if improving understanding of career opportunities would help children to engage, to identify the relevance of what they were learning and to form clear aspirational links to their future selves, building confidence without forcing them to pigeon-hole themselves into one particular future profession. Andrews and Hooley (2018) discuss the view that careers learning could support the functioning of the education system, including student engagement and attainment, the economy (by improving transitions to and within the labour market), social mobility and inclusion (Andrews & Hooley, 2018).

I gathered research from papers, journals, trusted news outlets, websites and organisations, primarily: The Wellcome Trust, The Sutton Trust and STEM Learning. These reports highlighted that many children felt that their education was lacking vital science learning and quality experiences



(Wellcome, 2017). Teachers felt less confident about teaching science and STEM (Wellcome, 2018), which further affected these issues, along with a lack of Continuing Professional Development (CPD) take-up and embedded cultural opinions regarding women in STEM careers. In addition, many children lack support at home and their science/cultural capital is low (Archer *et al*, 2016), meaning that they have not had enough science experiences out of school to have developed an affinity or interest in the subject. As illustrated by the Sutton Trust's *Elitist Britain* (2019), it is absolutely vital to widen opportunities and make level the chances for all individuals to increase social mobility. Frey and Osbourne (2013) identified STEM skills as 'highly required' for a wide range of future careers.

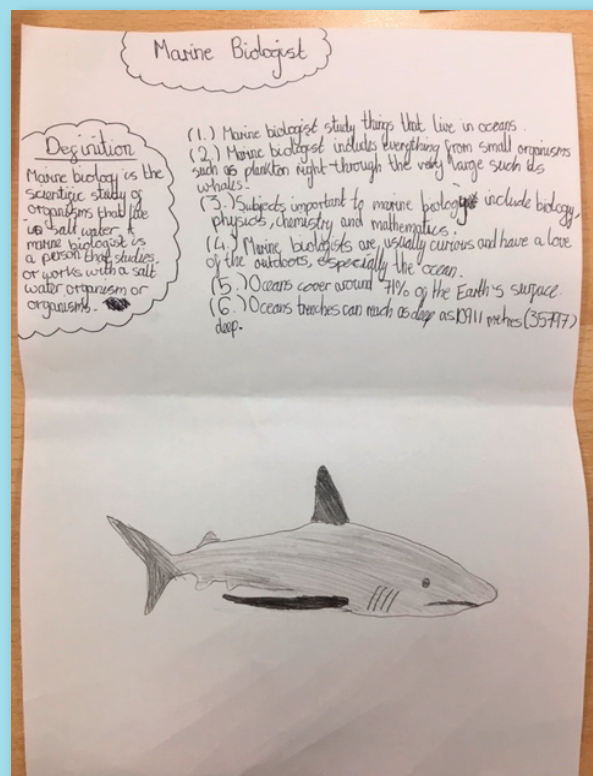
Methods

My Action Research (AR) project was undertaken during autumn 2019 and the subsequent analysis and dissertation in spring/summer 2020 in order to answer the following research question:

- To what extent does the introduction of careers information during Year 6 STEM lessons have a positive effect on children's motivation, enthusiasm and engagement?

I chose to focus on my Year 6 class; a small-scale project would maximise access and help with consistent data collection, although with four classes in Year 6, comparisons could also be drawn. My class consisted of an inclusive group of 20 children, many with various barriers (physical, academic and mental health-related).

A mixed methods approach was used to gather empirical evidence and data (Lauer & Asher, 1988). Qualitative and quantitative data were collected throughout proceedings (ASE, 2012), including a quantitative pre- and post-survey, and a range of qualitative classroom data such as pupil voice, questions they raised during visits, interactions from visitors, careers-related project and class work. Repeat collection of data allowed for correlation, analysis and ultimately conclusions to be drawn. Attainment data could also be compared



Photos 1 & 2. Children independently researched their careers of interest at school using BBC *Bitesize*, for example: NHS paramedic (photo 1) and Marine Biologist (photo 2).



to previous academic performance. Permissions were obtained and surveys were completed by my class, school staff and parents/carers (online) at the beginning and end of the autumn term. During the term, many opportunities for careers education were provided, including visits from STEM professionals and outside visits to places of work. Employment and careers links were also made in class work, making learning relevant, for example, when learning about the environment; professions explored included marine biology, air pollution control and electrical engineers investigating carbon omissions.

Careers education is closely aligned with Personal, Social, Health and Economic (PSHE), where children focus on their character traits and become more thoughtful about what possible careers would suit them and make them happy as an adult. They learned more about salaries, interview processes and career progression through BBC *Bitesize Careers* and the National Careers Website, and by accessing resources from the Centre for Industry Education (CIEC) to learn more about working in industry. They played activities such as *Careers Top Trumps*, where they created information cards about their professions of interest to play in groups.

The aim was to expose my pupils to a wide range of careers information, visits, visitors and activities, to enable them to consider the jobs market of the future and their own suitability regarding personal characteristics.

Findings

Surveys

In the initial survey in September 2019, colleagues stated that they felt that STEM careers information is appropriate for primary school students, with an average score being recorded of 4.9 out of 5. They also stated that pupils were enthusiastic about STEM subjects. Only 7 parents initially responded. This was repeated at the end of the project in December 2019. There was a marked increase in parent participants upon recompletion, which highlights improved understanding and engagement. The survey results from children demonstrate improved understanding and appreciation of STEM careers (Figures 1-4).

Following the wide range of careers information, visits, visitors and activities, the pupils in my class showed an increased engagement and understanding of STEM-related subjects and careers. They showed motivation to progress

Figure 1. Children's survey: 'At school I learn about different career choices that use STEM'.

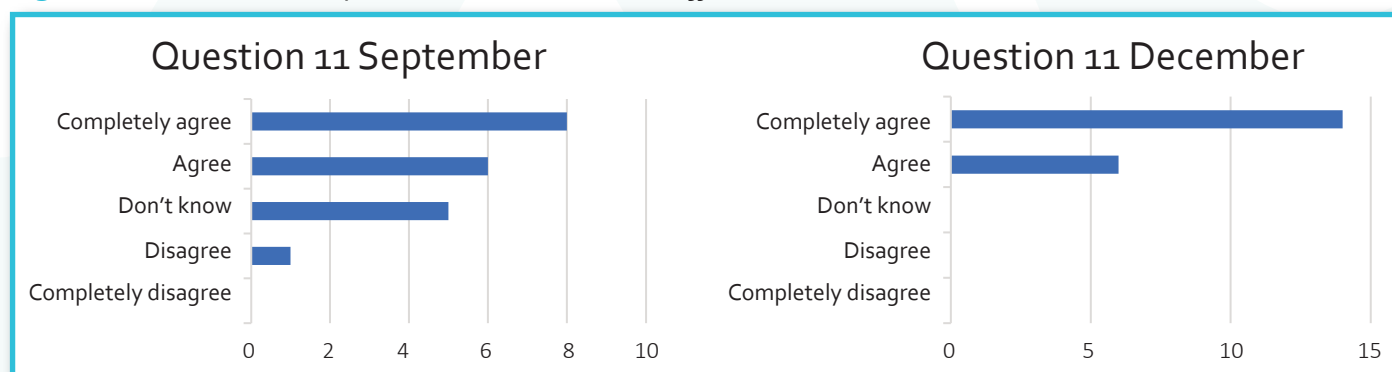


Figure 2. Children's survey: 'I know what qualifications I need for a STEM job'.

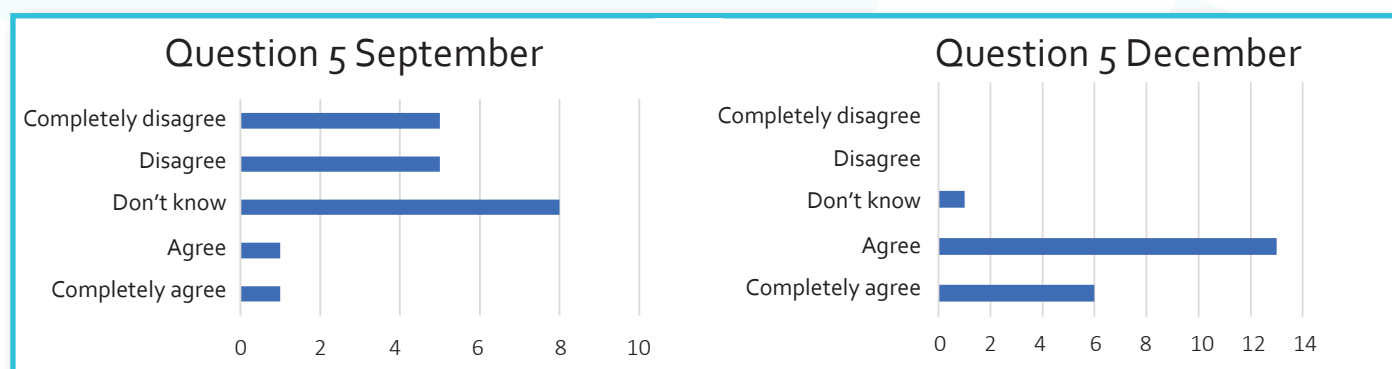


Figure 3. Children's survey: 'To have a STEM job you must be clever'.

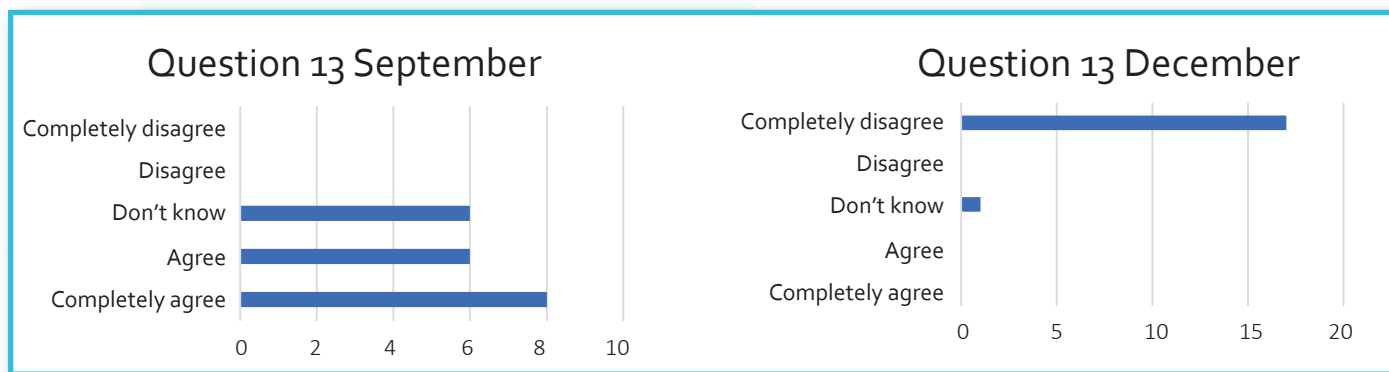
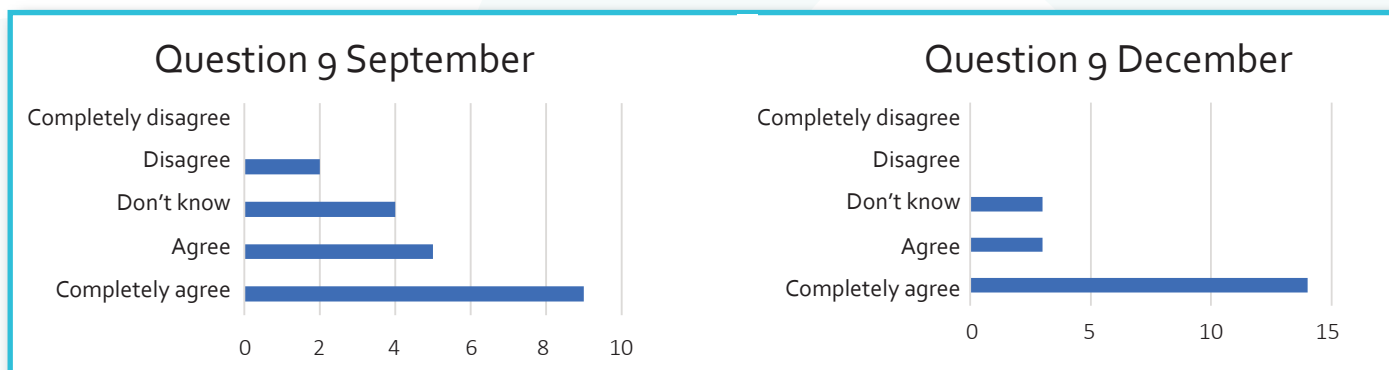


Figure 4. Children's survey: 'In future, we will need more STEM qualified people'.



through pupil voice and questions that they raised during visits to college and at our careers event. Evidence was gathered from survey data analysis, together with examples of careers-related project work and interactions from visitors. Changes in attitude towards careers clearly highlight the benefits of careers information at primary school (in accordance with the aims of the Careers Strategy) in only one term of implementation.

Attainment within science lessons improved at an accelerated pace for most, but not all, in my class. This was evident through summative data. What could certainly be seen was a group of maturing children who were far more motivated to participate and who had more of an appreciation for and understanding of STEM-related subjects. Having an engaged, driven and enthusiastic role model had undoubtedly had a positive impact.

Examples of visits and activities

Local college visit

The whole of Year 6 visited our local college to experience career environments and develop an understanding about career availability and

Photo 3. East Riding College visit – Barbara Young (Tutor).



Photo 4. Primary Futures Careers Event. Chris Benson, Specialist Cardiac Physiologist, Yorkshire NHS answering pupil questions.



paths, apprenticeships and further/higher education. They took part in careers workshops and experienced various working areas such as the mechanics garage, the construction area, the Medical Department and more. They also visited the library and student support areas. Interest was enhanced and homework resulted in fact files about various careers. The college tutor also commented on how pleased she was regarding the interest shown by my class. She stated that there was a distinct increase in pupil knowledge and engagement compared to the other classes.

Primary Futures Careers Event

During our Primary Futures Careers Event, visitors included the CEO of the local council, an AI/robotics expert, a cardiac physiologist and an archaeologist/forensic scientist. Children played *What's my Line?* with the visitors (who had each brought a small prop as a clue). Subsequently, there were various sessions for classes, with the aim to develop an 'I can do' attitude. This was highly inspirational and informative for our pupils. A feedback survey for the careers event highlighted pupil positivity: 100% stated that men and women can be equally successful and also that maths, English and science can be useful in many jobs. They also concluded that the event had *'made me feel that I can become anyone I want when I grow up'*. This was in stark contrast to findings of the Wellcome Trust enquiry in 2017, *Young People's Views on Science Education*, which found that only 26% of pupils said that the work they did was *'relevant to their lives'*. Having the (female) CEO of

our local authority involved was vital; providing real life examples of successful women in important roles certainly had a positive impact. Riley, aged 11, commented on what a difficult job she had and how surprised he was initially to learn of her 'high-powered' role: *'She has a hard job; there is such a lot to do. She wasn't wearing a suit but she was a VIP'*.

Other visitors

Visitors such as Yorkshire Wildlife Trust (YWT) employees talked about routes into careers plus challenges and characteristics that have helped them on their learning journey. 'Skype a Scientist' enabled Dr. Bence Viola, a paleontologist at the University of Toronto, to link with our class when a student found a fossilised mammoth tooth on the beach, estimated to be one and a half million years old. Dr. Viola and the pupils were equally thrilled.

Ross O'Brien (from BP) challenged children in a local, relevant way to create a device to improve the environment. They enjoyed utilising creative and collaborative skills: an excellent example of Equity Compass in action (Archer *et al*, 2020), whereby children were engaged in social action and learning through hands-on engagement and tinkering. In addition, we developed NASA links



Photo 5. Visit from paratroopers.



through the Challenger Learning Centre (CLC) in the USA: children asking questions during a live transatlantic link. Paratroopers also visited our school; one was a past pupil. Our children could see that someone just like them had achieved their dream in the world of work.

Farmer Time is an educational incentive created by 'Farmer Tom' Martin and LEAF. Farmer Colin is our allocated farmer who helps the children to understand more about farming, the countryside and environmental issues. The students enjoy the novel educational strategy and also asking questions. They followed *Bloodhound* during their attempt to break the world land speed record, via the *Bloodhound* website/ *Newsround*. We discussed the different jobs that would have been involved in the team surrounding the vehicle and qualities that they would have had to possess.

We have also been working with the Science and Engineering Education Research and Innovation Hub (SEERIH) at the University of Manchester, developing Engineering Habits of Mind (curiosity, open-mindedness, resilience, resourcefulness,

collaboration, reflection, ethical considerations and a growth mindset) with our pupils (RAE, 2017). The children have undertaken various engineering tasks as part of a national movement regarding engineering at primary. They have thought carefully about the various aspects of engineering and how it affects every part of our lives, skills involved being highly transferable. They have learned to 'tinker' and learn by trial and error.

Drawing the Future (2019) states that 'Children arrive in school with strong assumptions based on their own day-to-day experiences'. With 'sportsman' (8%) and 'social media and gaming' (9%) being favoured careers for boys, and 'teacher' (19%) for girls, even at a young age gender equality needs to be pursued. This project has worked to develop confidence regarding STEM subjects and possible future careers. Encouragingly, preferences stated by females in my class included being an author, a lawyer, a marine biologist and a paramedic. Careers in IT such as graphic designer and animator were also highlighted by males in the class, as well as the desire to be a chef and a doctor. The types of jobs in which the children now have an interest definitely show more thought and aspiration.

The teacher questionnaire enquired about child opinions regarding careers. One response captures the general feeling in this regard: '*Children already state, "I'm not good at..." or "... it is boring". These opinions affect how they engage with the subject. Giving children full and varied experience in STEM /science subjects is essential to ensuring that they feel happy, engaged and confident, so that "I can..." and "I love..." become their opinions. Lifelong loves start in childhood'* (Anonymous, Staff Questionnaire, 2019).

Conclusions

Gutman and Ackerman discuss that science-related careers are viewed by many as 'only for a the brainy few' and that there is an association of 'cleverness' with white middle-class masculinity: female working class and some minority ethnic students are less likely to imagine themselves following science careers, even though they like science and aspire highly (Gutman & Ackerman, 2008). This project has worked (in a small way) to challenge that view. However, in agreement with *Nothing in Common* (2013), I have come to the realisation that:



Photo 6. Progressing to be an engineer (RAEng, 2021).

'Children are unable to understand the breadth of ultimate job opportunities across the economy... potentially identify(ing) unrealistic career aspirations. There is no desire to quash the dreams of children, but having some grasp of the difficulty/ realistic chances of attaining their goal should be understood – having a "Plan B"' (Mann et al, 2013).

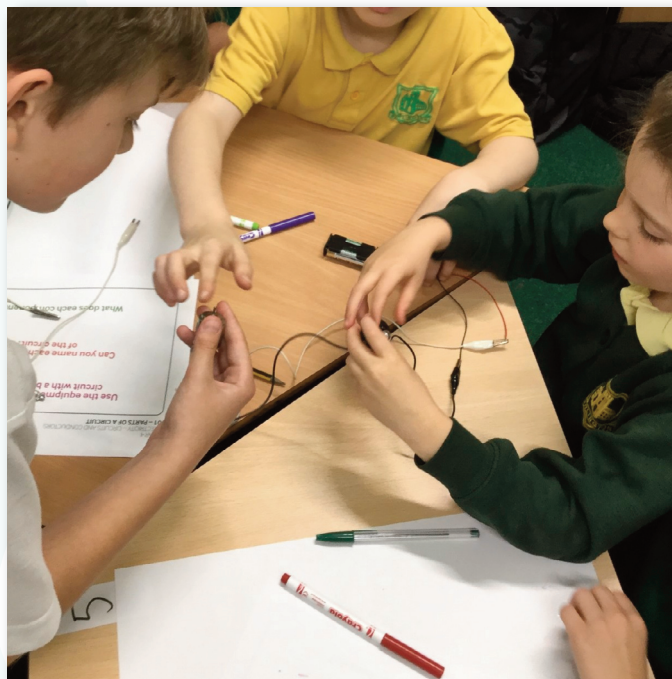
Developing resilience, confidence, belief and aspiration is key at primary school in order to enhance self-esteem and a positive growth mindset (Dweck, 2016). In addition, making learning local, relevant, achievable and accessible are seemingly the strategies to build knowledge and understanding for our pupils (OECD, 2020).

Whittaker and Booth (2020) discuss the potential damage of the pandemic, stating that the attainment gap could be widened by as much as 75%, which would have a very damaging effect on STEM careers take-up and bridging the STEM skills gap.

As a result of my findings throughout the research project, and after identifying other key researchers in this field, such as Carol Davenport and NUSTEM, our school engaged in the 'Careers Mark' @CompleteCareer: a national accreditation for primary schools. This was funded by the Skills Support for the Workforce project (SSW), European Social Fund (ESF) and Local Enterprise Partnership (LEP). The successful assessment took place across Year 6, which has laid the foundations to embed careers learning across all of Key Stage 2 going forward. This is recognition of the value and effectiveness of careers information.

In addition, we have developed further transition links with secondary schools in our town, in part through our ØRSTED-funded STEM Enthuse Partnership. These included cross-Key Stage 2/3 phase planning and team teaching, which was highly enjoyable and effective. Some of the Key Stage 3 (ages 11-14) pupils, including past pupils of our school, visited us to peer mentor our Year 4 (ages 8-9) children, and the Lower Key Stage 2 (LKS2) pupils visited the local secondary school, which started to develop transition links and dispel pupil concern regarding future education paths. This also developed an interest in Key Stage 3 science through sessions attended in the Key Stage 3 science labs.

Photo 7. STEM Enthuse Partnership: Team Teach/ Transition activity with Bridlington Secondary School – peer support (Year 8 with Year 4).



Going forward

In a fast-changing economy, it is essential that we make school and the workplace more closely connected than ever before, so that young people from all backgrounds have the knowledge, skills and experience to succeed in work (DfE, 2017, p.35). It is about ensuring that young people emerge from the education system with the skills and knowledge that enable them to anticipate in post-compulsory education, in working life, and to become the workers, leaders, entrepreneurs and citizens of the future (Andrews & Hooley, 2018, p.3). I will continue to develop links with industry and organisations such as CIEC to ensure progression of careers learning going forward; our Year 5 (ages 9-10) children have taken part in Children Challenging Industry activities through CIEC this year.

As discussed by Elliot (1991), analysis in action research has led me to many more avenues for research. OECD Dream Jobs (2020) raises so many more questions: realistically, will pupil career choices still be viable in 15 years? These are often unrealistic, stating a job based on television influences yet not willing to continue learning to achieve the experience and qualifications required. How do we ensure that children are savvy regarding career choices going forward, so to ensure that they are not all in competition for the



same jobs in a field with only limited chances of success? How do we inspire pupils to be more outward looking and how do we educate pupils with effective IT skills to meet future demand?

Effective career guidance should encourage children to reflect on who they are, who they want to become and to think critically about the relationship between their educational choices and future life (OECD Dream Jobs, 2020). I will strive to continue to support my pupils to the maximum of my ability as they progress on their journey to adulthood and a career that is fulfilling, appropriate to their needs and which enables them to achieve self-actualisation (Maslow, 1943).

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