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Understanding High School Subject Choice and the Decision to Pursue a Career in STEM

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Understanding High School Subject Choice and the Decision to Pursue a Career in STEM

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Summary

The primary aim of this thesis was to gain a broad overview of students' attitudes towards subjects and careers in the domains of science, technology, engineering, and maths. A secondary aim was to gain further understanding about the impact of the promotion and educational work carried out by Horizon Nuclear Power—a nuclear power company in North Wales.

Chapter 1 begins with an overview of the current STEM education system in North Wales and some of the factors believed to influence attitudes towards STEM. Moreover, this chapter outlines the work that Horizon Nuclear Power do. In Chapter 2 we present two complementary studies conducted in North Wales high schools. The first study analysed the results from an online survey with students in Year 7, Year 9, and Year 12 ($N = 238$). We found that the students did not view people who do well in STEM as "nerdy", they felt encouraged by their parents to do well in STEM, and factors such as earlier attainment affected their decision to pursue STEM subjects for GCSE/A Level. Study 2 used focus groups ($N = 25$) to further explore the stereotypes that these students held in relation to STEM professionals. We found that the students held clear perceptions about what STEM professionals look like, act like, and what they do. Furthermore, this study outlined some of the potential driving factors behind post-14 subject choice and students' understanding of further education and training. Chapter 3 aimed to take the viewpoint of students who had decided to pursue STEM training post-16, in the form of Horizon Nuclear Power's technical apprenticeship scheme ($N = 10$). A thematic analysis of the interview transcripts revealed five themes. These relate to the decision-making processes behind the decision to pursue a STEM pathway and the advantages associated with apprenticeship schemes. Finally, we discuss the outcomes of this thesis in Chapter 4. This includes the implications for Horizon Nuclear Power and directions for future research.

[Chapter 1] A review of high school STEM education and career pathways literature

The importance of a STEM education

The acronym STEM denotes four complementary disciplines: science, technology, engineering, and maths (Breiner, Harkness, Johnson, & Koehler, 2012). Each of these disciplines gives an individual the opportunity to think logically, solve problems, and work collaboratively (Welsh Government, 2012). DeCoito (2014) explained that STEM subjects provide individuals with skills that are transferrable from an educational environment to the wider society. An effective STEM education is necessary to function in the modern world, where technology is rapidly advancing (Voogt, Erstad, Dede, & Mishra, 2013). There is an expectation for individuals to react to the technological demands of the workplace, from sending an email to using complex machinery (Karsten, 2016). Carnevale, Smith, and Melton (2011) outlined that success in STEM-related subjects at school can lead to a diverse range of occupations such as architecture, business, and medicine. This highlights various prospects associated with STEM education.

In industry, a strong STEM skills set can lead to research, development, and innovation (Marginson, Tytler, Freeman, & Roberts, 2013). These skills are at the forefront of productivity and are essential for sustained economic growth (Kier, Blanchard, Osborne, & Albert, 2013). Gross domestic product (GDP) is a measure of the size and health of a country's economy. A rise in GDP signifies a growing economy, whereby consumers are spending more and businesses are expanding (Bank of England, 2017). Hanushek and Woessmann (2010) reported that deficits in STEM skills can lead to shortfalls in economic performance and limit economic possibilities, and thus lead to reductions in GDP.

High school STEM education: Course structure

The education system in Wales offers students multiple learning pathways through education. Between the ages of 14 and 16 students study for their General Certificate of

Secondary Education (GSCEs). At this level, they are able choose which subjects they study alongside a compulsory curriculum (Careers Wales, 2017a). The compulsory curriculum includes subjects such as science, information technology (IT), and maths (Department for Education, 2014; Welsh Government, 2016). The uptake of other STEM subjects, such as design and technology (DT) and engineering are optional past the age of 14 (Department for Education, 2014).

Over the last decade, educational reforms have seen changes in the delivery of maths and science at GCSE level (Estyn, 2008; Welsh Government, 2014). The new science pathway aimed to better cater for students of ranging academic abilities, offering students to choose between three different approaches of studying the subject. *GCSE science* and *additional science* teaches science-related concepts through the means of enquiry and research-based learning, whilst GCSE *applied science* aims to map scientific concepts to everyday life. The final choice allows students to study science in its three distinct disciplines: biology, chemistry, and physics (Estyn, 2008). Changes to the GCSE numeracy framework aimed to cover a broader range of mathematical skills, with students now completing two compulsory maths GCSEs. One teaches the mathematical techniques needed for further progression within academic subjects. The other applies maths to real-world scenarios, such as daily home and work tasks (Welsh Government, 2014). These changes offer a platform for all children to understand the importance and relevance of STEM outside of the classroom.

In Wales, students can leave compulsory education at the age of 16 (Gov.uk, n.d). Despite the choice to go into employment, a proportion of the population in Wales decide to pursue further education. For example, in 2013 a total of 105,039 Welsh domiciled students enrolled onto either a further education course, an open university course, or a university level degree, (Higher Education Funding Council for Wales, 2013). Typically, post-16

options are separated into two routes: academic and vocational (Maschi, Crawford, & Vignoles, 2010). The academic route is characterised by college-based qualifications, such as advanced levels (A Levels) and diplomas. An increasing number of students opt to complete A Levels as a gateway to university (House of Lords Select Committee on Social Mobility, 2016). Vocational routes often offer similar academic prospects in terms of employment and acceptance into university (UCAS, 2017). This route offers a mode of study that is not prescriptive to a syllabus, but instead outlines the behaviours that make a competent worker (Grugulis, 2003). Examples include *business and technology education council* (BTEC) qualifications and apprenticeships (City and Guilds, n.d.). Both routes offer students a method of developing knowledge in a range of disciplines, including STEM.

High School STEM education: Current issues

Attainment in STEM subjects. The programme of international student assessment (PISA) assesses the extent to which students, nearing the end of their compulsory education, have gained the key skills that they need to function in modern society. Students across 72 countries complete this survey at the age of 15. The assessment covers three core areas: scientific literacy, reading, and mathematical literacy (OECD, 2016). The most recent PISA report showed that schools in Wales are underachieving in science, maths, and reading compared to the rest of the UK (OECD, 2017). These outcomes highlight a need to raise student knowledge in these disciplines. Resultantly, Wales has continued in its curriculum reform efforts and developed educational policies with key stakeholders (Welsh Government, 2017). Effective advancements in curriculum design and educational policies may help students, in Wales, to achieve the same academic outcomes as students in other UK countries.

Uptake of STEM subjects. Many organisations have expressed a concern that not enough students are choosing to study STEM after the age of 16 (ASPIRES, 2013). The uptake of STEM subjects has shown to be particularly low in Wales, in comparison to the rest

of the UK (Science Advisory Council for Wales, 2013). Previous research has reflected on several factors that may result in students disengaging in STEM, such as the perception of the subjects being too difficult and lack of confidence (Brown, Brown, & Bibby, 2008).

Many students share the view that STEM subjects are more difficult than other subjects on the curriculum (Welsh Government, 2012). Moreover, there is a belief that STEM principles are more time consuming to understand (Ralph, 2016). For those considering going to university, it may be more strategic to take subjects that they perceive to be easier. By making this decision, students may reduce the risk of falling short of the entry requirements of their preferred institution (Noyes & Sealey, 2012). Taken together, this research suggests that students value the time and effort that they need to invest in subjects to achieve short-term goals.

STEM careers: Stereotypes

Sadler, Sonnert, Hazari, and Tai (2012) found that interest in STEM at the start of high school was a key predictor of later interest in a STEM career. Their analysis also revealed a distinct gender difference in the STEM fields that males and females aspired to pursue. Careers in health and medicine were more desirable amongst females, whilst males were more interested in engineering. Research has tried to understand why these gender differences occur. One explanation is the cultural stereotypes that have developed over time, shaping the view that jobs in the STEM field are more suited to males than females (Hill, Bowman, Stalmeijer, Solomon, & Dornan, 2014). Evidence suggests that even young children hold these stereotypes and these are developed through peer influence (Martin et al., 2013; Schoon & Eccles, 2014).

There are several underrepresented groups in STEM education and employment; this includes women and ethnic minorities. Bianchini (2013) described these groups as an underused resource for meeting the technological demand in modern society. The ratio of

males to females enrolled on STEM courses has reduced in recent decades. However, females are still less likely to pursue a STEM career than their male counterparts (National Science Foundation, 2011). Wang, Eccles, and Kenny (2013) suggested that this disparity results from a personal choice, opposed to a lack of ability in STEM disciplines. It is important to broaden the participation and success in STEM for these underrepresented groups, to fulfil the occupational opportunities associated with these fields (Lichtenberger & George-Jackson, 2013).

The literature suggests that there is a clear perception that certain jobs cater to a specific type of person; with research reporting quotes such as "*I suppose there's the nerdy kind of label over scientists opposed to artists or something…is there a certain kind of person? More likely to wear glasses*" (DeWitt, Archer, & Osborne, 2013, pp. 1464). Such stereotypes may serve to promote or inhibit matching between an individual and a career path (Nassar-McMillan, Wyer, Oliver-Hoyo, & Schneider, 2011). Stout, Dasgupta, Hunsinger, and McManus (2011) explained that people develop career goals based on stereotypes. They proposed that there are three external factors that can influence how individuals are perceived in a STEM environment: teachers, peers, and other experts (e.g., role models in the STEM industry). Thus, early influence and education may be an effective way to reform these stereotypes before their implications affect future decisions within education or careers.

Factors influencing uptake and engagement in STEM subjects

Exposure. Early exposure to STEM initiatives and activities seems to have a positive effect on students' perceptions (Bagiati, Yoon, Evangelou, & Ngambeki, 2010). DeJarnette (2012) claimed that early exposure to STEM initiatives and content can engage students in STEM from an early age. As a result, these students are more likely to achieve their STEM potential during high school (Corlu, Capararo, & Capararo, 2014). Since 2012, the National Science Academy has invested money in a diverse range of STEM enrichment projects

including workshops, science festivals, and study resources (Welsh Government, 2015). Welsh charities have also been involved in the delivery of STEM enrichment, such as the Engineering Education Scheme Wales (EESW, 2012). The EESW offer opportunities for young people to gain experience working with STEM professionals, in an industrial setting. These opportunities aim to show students that STEM careers can be diverse and stimulating (EESW, 2012). Initiatives such as these offer students the opportunity to experience STEM in a real-world setting, gain experience of working in industry, and create contacts in the field.

Enjoyment of STEM subjects. The science aspirations and career choice project (ASPIRES, 2012) found that lack of participation in STEM is not simply the result of students not enjoying the subjects. To increase participation in STEM, attention should be directed towards increasing students' science capital. In this context, science capital refers to a person's science-related qualifications, their understanding of science, interest in STEM, and having contact with someone who works in a STEM career (ASPIRES, 2012). DeWitt, Archer, & Osborne (2014) further supported the contention that students may enjoy science without the interest of pursuing it as a career. Findings from this research suggest that students' hold a positive attitude towards science between the ages of 10 and 14, yet few express a desire to become a 'scientist'. DeWitt et al. suggested that initiatives should focus on trying to keep science lessons engaging as students move towards key decisions in their education (e.g., GCSE and A Level subject choice).

External influence. Social support plays an important role in shaping students' attitudes and perceptions towards STEM. Students who receive greater social support from their parents, teachers, and friends for science and maths report more positive attitudes towards STEM. Furthermore, these students have higher perceptions of their abilities in STEM subjects (Rice, Barth, Guadagno, Smoth, & McCallum, 2013).

Recently, Hyde et al. (2017) communicated that parents may play an important role in motivating their child to choose to study STEM. Factors involved in guiding this decision include parents elaborating on the usefulness of STEM knowledge, and offering personalised guidance for their child. Rozek, Scododa, Harackiewicz, Hulleman, and Hyde (2017) offer evidence to suggest that if parents are given materials, detailing the importance of STEM for their child, they are more likely to encourage their child to peruse STEM subjects. By involving parents in STEM initiatives, and highlighting the relevance of STEM, it might be possible to enhance high school participation in STEM subjects.

There are several practices that teachers can employ to promote student engagement in STEM (as outlined by Skilling, 2014). These include (1) having discussions about the relevance and future value of STEM; (2) emphasising the practical application of STEM knowledge; (3) encouraging students to ask questions and to undertake independent investigation; (4) relating subject content to students' personal interests and; (5) developing a teacher-student rapport, so students feel more confident asking for help.

Horizon Nuclear Power

Job prospects. Predictions suggest that 1 in 5 new jobs in the UK will be in a STEM discipline by 2020 (Careers Wales, 2017b). One applied example of this is the jobs that will become available through Wylfa Newydd, a nuclear power station on the Isle of Anglesey. An estimated 9,000 workers will be needed during the peak of construction, with 850 permanent jobs being made available at the Wylfa Newydd site (Horizon Nuclear Power, 2017a).

Welsh language and culture. With an influx of migrant workers needed to fulfil this demand, people have expressed concern about the impact of the project on the region's language and culture (Parliament, 2016). From this cultural perspective, local authorities have explained that the high-quality jobs created by the station may prevent young Welsh

speakers moving away for work. As a result, the employment prospects offered through Wylfa Newydd may be successful in supporting a Welsh-speaking culture (The House of Commons Welsh Affairs Committee, 2016). Horizon Nuclear Power has since pledged its efforts to preserve and enhance the unique culture and language of the Isle of Anglesey. This included working with local education establishments to offer relevant training to help the community excel in the STEM sector. A desirable outcome of the project is that young people will be encouraged to engage with the local employment opportunities offered through Horizon Nuclear Power (Horizon Nuclear Power, 2016).

Education programme. Horizon Nuclear Power offer an educational programme aimed at inspiring young people to explore and engage with STEM as well as equipping them with the skills they will need to be successful in a STEM career. A pivotal part of this initiative is to inform school-age children about the work of Horizon Nuclear Power and the future job opportunities that will be available to them in the future (Horizon Nuclear Power, 2017b).

The company offer a range of resources for primary and high school aged children. For children aged 7 to 11, Horizon Nuclear Power offer an activity pack to schools. This pack covers topics that complement the existing school curriculum, such as how to calculate a carbon footprint and how nuclear energy works (Horizon Nuclear Power, 2017c). Their high school activities are designed to extend students' primary school knowledge and support skill development. Furthermore, the high school resources provide information about the pathways that can lead to sustainable careers in STEM (Horizon Nuclear Power, 2017d). The company also work in partnership with other organisations who deliver STEM enrichment opportunities across North Wales (Horizon Nuclear Power, 2017d).

Apprenticeship. If students leave school with five GCSEs (including English, maths, and science) then they are eligible to apply for the *Horizon Nuclear Power technical*

apprenticeship scheme. This offers an opportunity for students to gain valuable experience of working in the engineering industry and develop their STEM skillset (Horizon Nuclear Power, 2017e). For those who opt to complete a university degree Horizon Nuclear Power offer a graduate development programme. Successful graduates will gain 18-21 months of experience working in the nuclear industry (Horizon Nuclear Power, 2017f).

Conclusions

The demand for individuals with a baseline STEM knowledge is rising. Technology is advancing in modern society and a strong STEM workforce is needed to enhance the economy. However, many students in Wales are leaving school without the necessary qualifications they need in STEM to meet this demand. Research has shown factors, such as perceived difficulty and time commitment, influence why students may disengage with STEM subjects in high school. Schools are beginning to offer enrichment opportunities, to dispel these misconceptions. These opportunities aim to inspire students to explore STEM, both in the classroom and in industry. Horizon Nuclear Power are particularly interested in raising STEM aspirations due to the opportunities that they will be able to offer through Wylfa Newydd, in 2020. Further research may be beneficial to the development of initiatives aimed at increasing high school students' engagement in STEM.

Aims of the current thesis

This research project aimed to identify reasons why key stakeholders might opt-in or opt-out of pursuing STEM subjects and careers. The participants offer insight into the decision-making processes of high school students and STEM apprentices. A secondary aim of this research was to gain a deeper understanding about peoples' knowledge of Horizon Nuclear Power—a company that is becoming increasingly more involved with the promotion of STEM education and training in North Wales. The final chapter of this thesis outlines recommendations resulting from the research. This information aims to help shape the

development of the Horizon Nuclear Power education programme. In a wider context, this may have a beneficial impact on the delivery of STEM enrichment activities in North Wales.

[Chapter 2] Views of STEM subjects within high school education and awareness of career opportunities: A mixed-method approach

Abstract

The uptake of science, technology, engineering, and maths (STEM) disciplines is a concern in Wales. With STEM becoming increasingly more prevalent in modern society, there is pressure to ensure that students are remaining engaged with STEM subjects during high school—and developing a STEM skillset. Previous research has highlighted several key driving factors that may affect students' attitudes and perceptions towards STEM subjects and careers.

Study 1 aimed to build on the existing literature to identify some of the factors that may affect the uptake of STEM subjects in high school education. Using online surveys, we collected data from 559 students, in Years 7, 9, and 12 across North Wales. The results offer insight into how factors such as stereotypes, career aspirations, and parental involvement affect students' views of STEM subjects and careers. Furthermore, an analysis of qualitative responses highlighted three key themes relating to STEM subjects in high school education: (1) reasons for continuing STEM; (2) reasons for discontinuing STEM; and (3) the importance of studying STEM.

Study 2 employed a focus group approach to explore themes relating to STEM stereotypes, educational choices, and job prospects. We used thematic analysis to extract themes from focus groups with Year 7 and Year 9 students. A total of five prevailing themes were identified: (1) STEM professionals, (2) subject choice, (3) post-16 pathways, (4) local job prospects, and (5) Horizon Nuclear Power. We discuss the wider implications of these studies in relation to enhancing STEM uptake and attainment in high schools.

Introduction

The relationship between science, technology, engineering, and maths (STEM) is symbiotic; with knowledge in one informing another (Basham & Marino, 2013). Alongside subject-specific knowledge, STEM disciplines help individuals to develop their problem solving and critical thinking skills (Becker & Park, 2011). Over time, STEM skills have become an integral part of the modern world, with applications in both daily life and in the workforce (Voogt, Erstad, Dede, & Mishra, 2013). For example, STEM skills allow individuals to budget, use a smartphone, and use machinery (Aronin & Floyd, 2013; Karsten, 2016). For children born after the mid-1990s, technology and the internet has been accessible (Turner, 2015). Since the 1990s, technology and science has advanced—increasing the need for individuals to develop a core STEM skillset (DeJarnette, 2012). Dierking and Falk (2016) explained that individuals should be able to understand the fundamental principles of STEM and think critically, to adapt to these advancements. Despite the importance of STEM, OECD (2016) showed that many high school students in Wales are underperforming in STEM disciplines. Additional concerns relate to the number of students continuing to study STEM subjects for GCSE and A Level (ASPIRES, 2013). This indicates the need to understand why students disengage from STEM during their high school education.

In Wales, students can choose to disengage in certain STEM disciplines at the age of 14; when the subjects no longer form part of the compulsory school curriculum (Careers Wales, 2017a). This curriculum system has seen a decline in the number of students studying STEM at GCSE and A Level (Council for the Curriculum, Examinations, and Assessment, 2016). Some factors associated with the decision to disengage with STEM subjects include: teacher quality (Smith & Golding, 2015); perceived difficulty (Welsh Government, 2012); and a lack of confidence in their own ability (Brown, Brown, Bibby, 2008). Conversely, research has shown that factors such as usability of subject knowledge (Smith & Golding,

2017), having a parent who works in a STEM field (Codiroli Mcmaster, 2017), and understanding that STEM can be useful for careers in and beyond the STEM disciplines (Archer, DeWitt, & Dillon, 2014) drive students towards studying STEM subjects for GCSE and A Level. Deeper understanding of these driving factors could help educational programmes increase the appeal of STEM subjects. This could lead to more students developing their STEM skillset after the age of 14.

For those students who decide to study STEM post-14, the research focus shifts to understanding why they might underachieve. The latest PISA report illustrated that students in Wales are underachieving in key STEM disciplines (OECD, 2016). McGee and Martin (2011) explained students might underperform in STEM because of the *stereotype threat* phenomenon. The term 'stereotype' is used to define a belief about a group of peoples' attributes—whether that be positive, negative, or evaluative (Smith, 2014). These expectations often present an oversimplified opinion of, or prejudiced attitude towards, people belonging to that group (Narayan, Park, Peker, & Suh, 2013). Stereotype threat is a type of confirmation bias, whereby a person suppresses their academic performance to avoid the label of a negative stereotype. In an applied example, a student may not achieve their full potential in science to avoid the label of "nerd" or "boffin". McArthur (2009) suggested that people use these terms to outcast others who excel in STEM disciplines. Yet, Archer et al. (2014) claimed that the "nerdy" stereotype has been over assumed in its prevalence. In their qualitative analysis of STEM stereotypes, Archer et al. found that students perceive scientists as no different from everybody else. These two differing views pose questions about whether the term "nerd" is relevant in modern society in the context of an insult.

A growing body of research suggests that school-age children hold stereotypical beliefs about professionals in STEM disciplines (e.g., Avaraamidou, 2013; Eagly, & Linn, 2015; Miller, Boucher, Fuesting, Diekman, & Murphy, 2017). For example, studies suggest

that students are more likely to perceive STEM professionals as male (Andersen & Ward, 2014; Chou 2015, Master, Cheryan, & Meltzoff, 2016) and as high achievers (Naiser, Hawthorne, & Henley, 2014; von Wangenheim et al., 2016). Additionally, students show clear perceptions about what STEM professionals may look like, in terms of their physical features and clothing. For example, students perceive an engineer to be a male, with short hair, who is clean shaven, and wears ordinary clothes (Jung & Kim, 2014). One method used to assess these stereotypes includes the draw a scientist test (DAST; Chambers, 1983). This test uses inductive analysis to assess similarities between student drawings—allowing for researchers to conclude common stereotypes held about STEM professionals (Jordan & Duncan, 2009). Since its development, researchers have developed the DAST to further explore the scientist stereotype (e.g., Huang, Haung, & Wei, 2014; Miller, Eagly, & Linn, 2015). Research using the DAST has shown that students, from different cultures, hold stereotypical views of scientists. A common view is that scientists are middle-aged white men who work in laboratories, wear a laboratory coat and glasses, and conduct experiments (Tan, Jocz, & Zhai, 2017). Stereotypes such as these may be important to consider in relation to the stereotype threat phenomenon. To prevent these images inhibiting academic performance, role models should promote a more representative view of STEM professionals.

Following the decline of STEM uptake and performance, the Welsh Government (2016) highlighted a need to interest and motivate students to engage with STEM. High schools have seen an increase in the number of STEM initiatives available to achieve these aims (Welsh Government, 2015). Horizon Nuclear Power are an example of a company who have taken an active role in promoting STEM careers, to students, in Wales (Horizon Nuclear Power, 2017a). The company offers a range of resources to inform high school students about the skills that they need to develop and the pathways that they can take to pursue a career in a STEM industry (Horizon Nuclear Power, 2017b). We know of no research that has evaluated

the effectiveness of these resources, or how high school students view them. The studies below, using a survey (Study 1) and focus group methodologies (Study 2) investigate how high school students in Wales perceive STEM subjects and careers. In addition to this, we aimed to assess the extent to which students have contacted the resources and work provided by Horizon Nuclear Power.

Study 1: Subject uptake, career opportunities, and aspirations: A student survey

The primary aim of this study was to gain insight into how students in Years 7, 9, and 12 view STEM subjects and careers. Using online surveys, we aimed to discuss several themes within the literature such as stereotypes, attainment in STEM, subject choice, and external influence. The data allowed for identification of any quantitative difference between year groups, schools, and/or gender. We were also interested in the analysis of qualitative responses, to show any themes relating to engagement in STEM.

Methods

Recruitment

We invited high schools across North Wales to take part through email via contacts in Horizon Nuclear Power and GwE (The regional school effectiveness agency for North Wales). An example of the recruitment email can be seen in Appendix A.

Sample

All the students who took part in this research attended a high school in North Wales. A total of 238 students completed the Year 7 survey (110 males, 126 females, 2 gender undisclosed; aged 11-12 years), 212 students completed the Year 9 survey (103 males, 108 females, 1 gender undisclosed; aged 13-14 years), and 109 completed the Year 12 survey (43 males, 65 females, 1 gender undisclosed; aged 16-17 years). Not all year groups, in each of the four participating schools, completed the survey due to timetabling constraints. Table 1 displays sample size across schools. Horizon Nuclear Power had varying involvement with

these schools prior to the survey. School 1 and School 3 had received the most input, school 2 had received moderate input, and school 4 received no input at all.

Table 1

Number of Students in Each Year Group Who Completed the Online Survey

	School 1	School 2	School 3	School 4
Year 7	105	79	-	54
Year 9	103	44	-	65
Year 12	-	17	80	12

Note. Hyphens denote missing data from the corresponding school year group.

Ethics

This research gained full ethical approval by the ethics committee at Bangor University. Some of the students who completed the survey were under the age of 16, with all being in full-time education. In compliance with ethical guidelines, parents of all students involved in this study were given an information sheet and parental opt-out consent form (see Appendix B). Return of this form excluded the student from taking part in the survey. In addition to this, students gave their own consent on the first page of the online survey (see Appendix C). All the names of schools and children have been anonymised throughout this report.

Materials

The research team created a survey for each target year group (Year 7, Year 9, and Year 12). The surveys were available in English and Welsh and published using Bristol Online Survey (2017). Each year group survey included a combination of Likert-scales and open questions, addressing a range of level-appropriate questions (see Appendices D, E, & F respectively).

Setting

The survey took place at the students' own school. Teachers reserved a room with internet enabled computers to allow the students to complete the survey. Students completed the survey during a lesson on a typical school day.

Survey design

All the subscales outlined in this section consisted of questions rated on a five-point Likert-scale from strongly agree to strongly disagree, unless stated otherwise. In cases where the subject may not be offered on the school curriculum a "not applicable" option was available.

If a student did not answer all the items on the scale, or responded with "not applicable", then their responses were removed from analysis. A Cronbach alpha analysis showed the reliability of each subscale. We removed three subscales that produced an alpha value less than .70, as this would indicate low internal reliability (see Tavakol & Dennick, 2011). Included subscales are detailed below.

Achievement in STEM subjects. The question "I get good grades in _____" assessed students' views about their attainment in science, technology, engineering, and maths. We collected data from students in Year 7 and Year 9 for this question, whereby information technology (IT), maths, and science form part of the compulsory curriculum. The Cronbach alpha value for this subscale showed high levels of internal consistency ($\alpha = .73$).

Parental encouragement. This subscale included a total of four questions. The questions assessed whether students felt that their parents encouraged them to do well in the STEM disciplines. This subscale generated an alpha value that suggests high reliability ($\alpha = .76$).

The perception that people who do well in STEM are "nerdy". Year 7 and Year 9 students rated the following statement: "I think people who do well in _____ are nerdy". In

turn, these items assessed opinions towards science, technology, engineering, and maths. This subscale showed high levels of reliability ($\alpha = .92$).

We also collected quantitative data using singular questions—that did not form part of a larger subscale—to gain insight into students' knowledge of Horizon Nuclear Power, how STEM applies to the real-world, and students' awareness of local apprenticeships. The Year 12 students rated the support that their school offered them to help them choose which course they should study at university. Furthermore, we collected qualitative data relating to the importance of STEM and subject choice.

We asked all students to state the career they would like after they have finished education, or further training. We coded their responses into STEM and non-STEM professions (see Appendix G). If a student responded with more than one career, then we accepted the first typed response. Furthermore, if a student gave a vague or unspecified response that could not be categorised into a STEM or non-STEM career, we excluded the data from our analysis (e.g., "I want to be a teacher). Similarly, the Year 9 and Year 12 students gave a list of the subjects that they had chosen to study for A Level and/or GCSE. We coded the data to denote STEM and non-STEM subjects (see Appendix H). The sum of these data gave individuals a "STEM subject quota"—the higher the value, the more STEM subjects they chose to study.

Procedure

Once all the students arrived a researcher introduced the study and outlined the ethical protocol. After reading the information sheet provided, the students could consent to taking part in the survey. Confirmation of consent allowed the students to progress onto the survey questions. A researcher was available throughout to answer any questions.

Data analysis

Quantitative data. We used parametric tests to handle subscale data. When investigating the effects of gender (i.e., male and female) we used an independent sample t-test. Where the grouping variable had three or more levels (i.e., different schools), we used a one-way ANOVA.

Some of the Likert-scale data did not form part of a larger subscale; for these questions, we performed non-parametric analyses. This included the use of a chi-squared analysis, to show any gender differences, and a Kruskal Wallis test to show differences between schools. Within the ANOVA and Kruskal Wallis analysis, we used post-hoc analyses to find where the significant relation(s) occurred. When appropriate, we also ran correlational analyses to determine if two variables co-varied.

Qualitative data. Several of the survey questions generated qualitative data, across Years 7, 9, and 12. We aimed to use a range of open ended questions (e.g., "If you decided not to choose Engineering, what put you off or stopped you?" to avoid prompting specific opinions. To analyse these data, we adhered to the six stages of thematic analysis outlined by Braun and Clarke (2006). This allowed for the identification of key themes within the dataset. During the familiarisation stage, a researcher exported the data into an Excel spreadsheet and read each response twice. On the next reading, the researcher made a note of salient and emergent themes within the data. This stage informed the conceptualisation of codes (meaningful elements within the data). Following this, each qualitative response was assigned to a code—with new codes being developed as appropriate.

These codes were later transferred onto post it notes, to allow for the exploration of themes within the dataset. After refinement and validation with the original dataset, we developed the final thematic map (see figure 1). The final stage of analysis involved creating a narrative from the themes, to present for write up. This can be seen in the qualitative results section of this report.

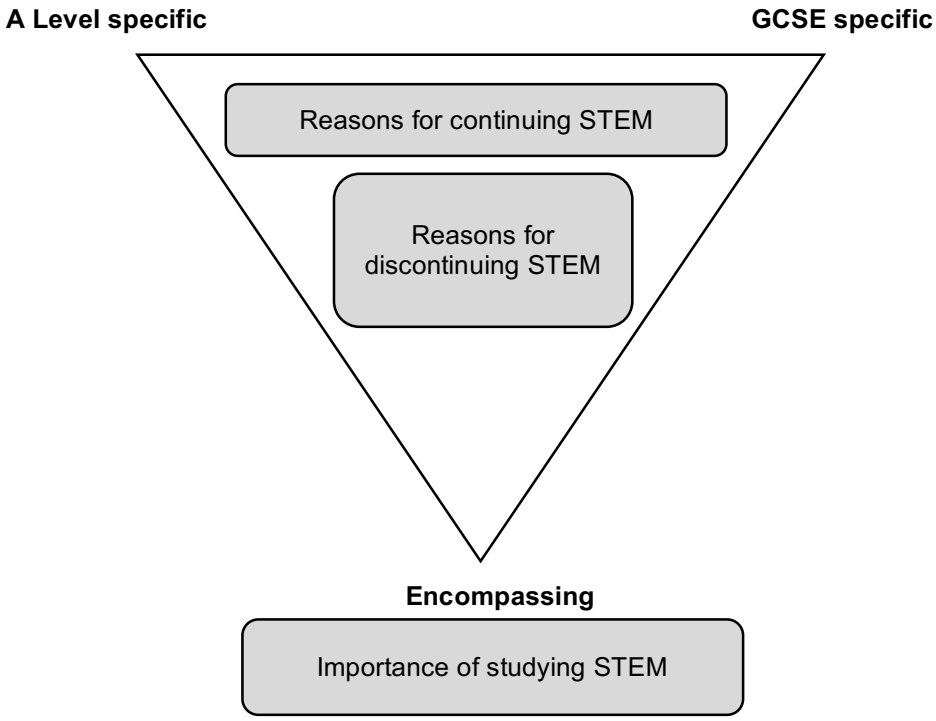

Figure 1. The final thematic map extracted from the qualitative survey responses.

Results: Quantitative

Self-reported achievement in STEM

No significant differences were found between School 1 (M = 14.43, SD = 3.13), School 2 (M = 13.92, SD = 2.27), and School 4 (M = 14.36, SD = 3.01) on self-reported achievement in STEM; $F(2) = 0.76$, $p = .470$. We collapsed this data to investigate the effects of gender and year group. No significant differences were found between gender (Male: M = 14.58, SD = 3.08; Female: M = 14.01, SD = 2.92; $t(297) = 1.64$, $p = .103$) or Year group (Year 7: M = 14.50, SD = 2.97; Year 9: M = 14.00, SD = 3.03; $t(300) = 1.43$, $p = .154$) on self-reported achievement in STEM.

Perception that people who do well in STEM are "nerdy"

Students in School 1 (M = 8.21, SD = 3.85), School 2 (M = 7.78, SD = 3.61), and School 4 (M = 7.36, SD = 3.54) showed no significant differences when asked if people who do well in STEM are nerdy; $F(2) = 1.87$, $p = .155$. Again, we collapsed these data to

investigate the effects of gender and year group. No significant differences were found between how males (M = 8.17, SD = 4.07) and females (M = 7.58, SD = 3.35) perceive people who do well in STEM; $t(140) = 1.59$, $p = .113$. No significant effects were seen between the Year 7 (M = 7.92, SD = 3.80) and Year 9 students (M = 7.79, SD = 3.62): $t(413) = 0.37$, $p = .713$. The distribution of these results is depicted in figure 2.

Relationship between attainment and "nerdy" stereotype

To show if perceived attainment and the perception of people who do well in STEM are "nerdy" co-vary, we conducted a correlation analysis. The analysis revealed a significant relationship between the two variables; $r = -.15$, $p = .012$, $N = 294$. Students who reported achieving good grades in STEM were less likely to perceive STEM as "nerdy".

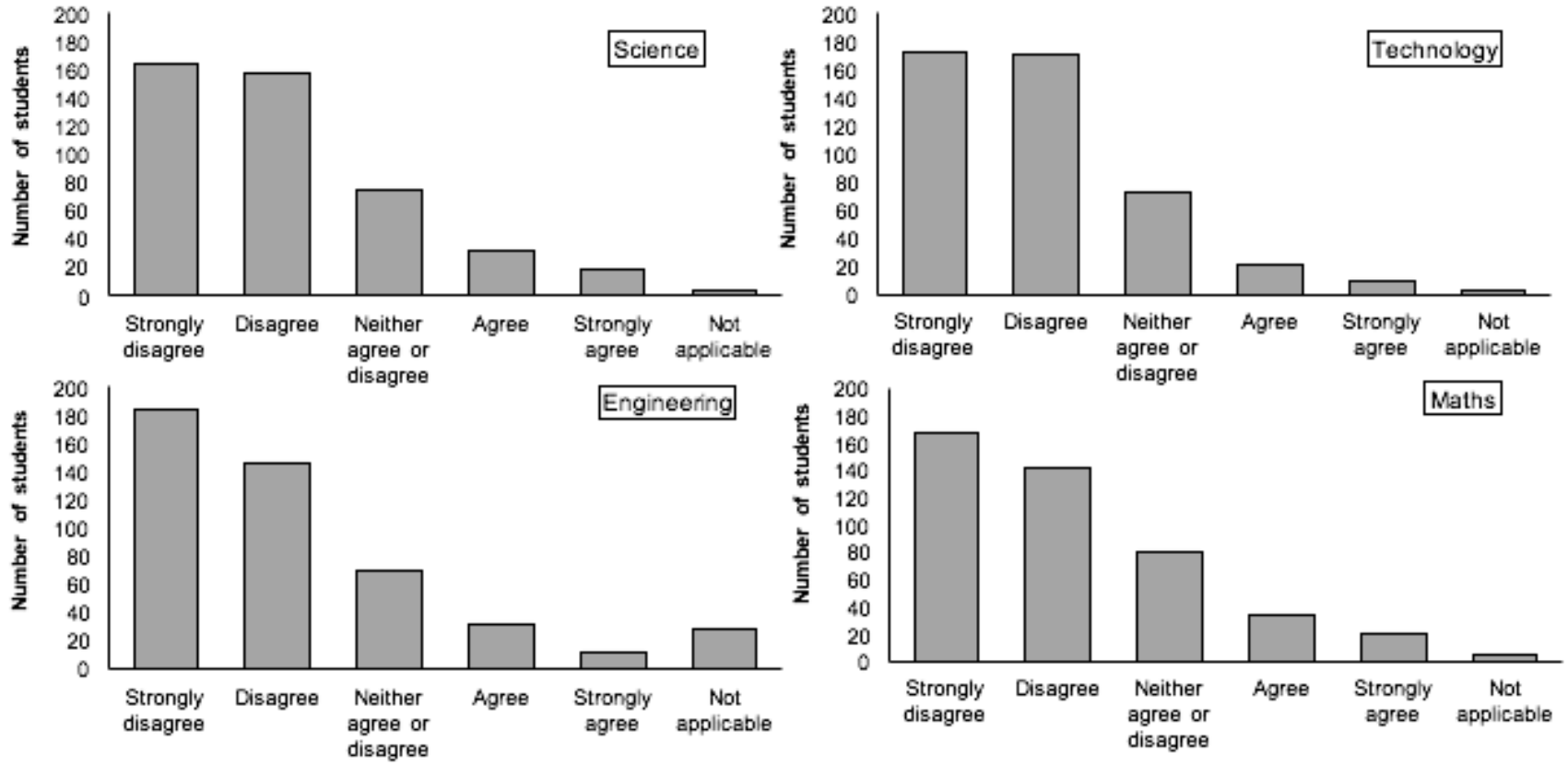

Figure 2. Distribution of student responses to the question "I think people who do well in _____ are nerdy". Responses collapsed across gender, year group, and school

STEM subjects studied

We collected data from students in Year 9 and Year 12 to see which subjects they have chosen, or chose to, take for GCSE. No significant effects existed between schools; χ^2 (3) = 6.45, p =.092, year groups; $\chi^2(1) = 1.17$, $p = .279$; or genders; $\chi^2(1) = 3.30$, $p = .131$ on the number of STEM subjects taken for GCSE. Percentages are displayed in Table 2.

Table 2

Percentage of Students Who Have Taken, or Did Take, GCSEs in STEM subjects

	Year 9			Year 12		
Number of STEM subjects taken	School 1	School 2	School 4	School 2	School 3	School 4
0	28.16	27.27	35.94	26.47	24.36	66.67
1	39.81	27.27	37.50	17.65	39.74	25.00
2	18.45	31.82	25.00	5.88	30.77	8.33
3	12.62	13.64	1.56	-	5.13	-
4	0.97	-	-	-	-	-

Students in Year 12 also gave a list of the subjects that they have chosen to study for A Level. Our analysis revealed no significant differences between schools; χ^2 (2) = 1.86, p = .394; or gender χ^2 (1) = 1.61, p = .204. Percentages are displayed in Table 3.

Table 3

Percentage of Year 12 Students Taking A Levels in STEM subjects

Number of STEM subjects taken	School 2	School 3	School 4
0	17.65	28.75	33.33
1	29.41	28.75	25.00
2	11.76	17.50	16.67
3	23.53	15.00	25.00
4	11.77	10.00	-
5	5.88	-	-

STEM career aspirations

There are no significant differences between male and female aspirations to pursue a career in a STEM discipline; χ^2 (1) = 2.53, p = .112. However, a significant difference existed between schools; χ^2 (3) = 12.56, p = .006. A pairwise comparison revealed that more students in School 3 wanted to pursue a career in STEM (with a mean rank of 242.17) than students in School 4 (with a mean rank of 179.84); p = .003. Our analysis found further significance between the aspirations of students in different year groups; χ^2 (2) =7.53, p =.023. A pairwise analysis showed that students in Year 7 were significantly less likely to want to pursue a career in STEM (mean rank = 193.36) than students in Year 12 (mean rank = 233.25); p = .019. Percentages are displayed in Table 4 and Figure 3.

Table 4

Percentage of Students Aspiring to Peruse a Career in a STEM Discipline Across Schools

	School 1	School 2	School 3	School 4
Year 7	50.05	51.67	-	70.73
Year 9	44.83	55.56	-	58.14
Year 12	-	45.45	33.33	57.14

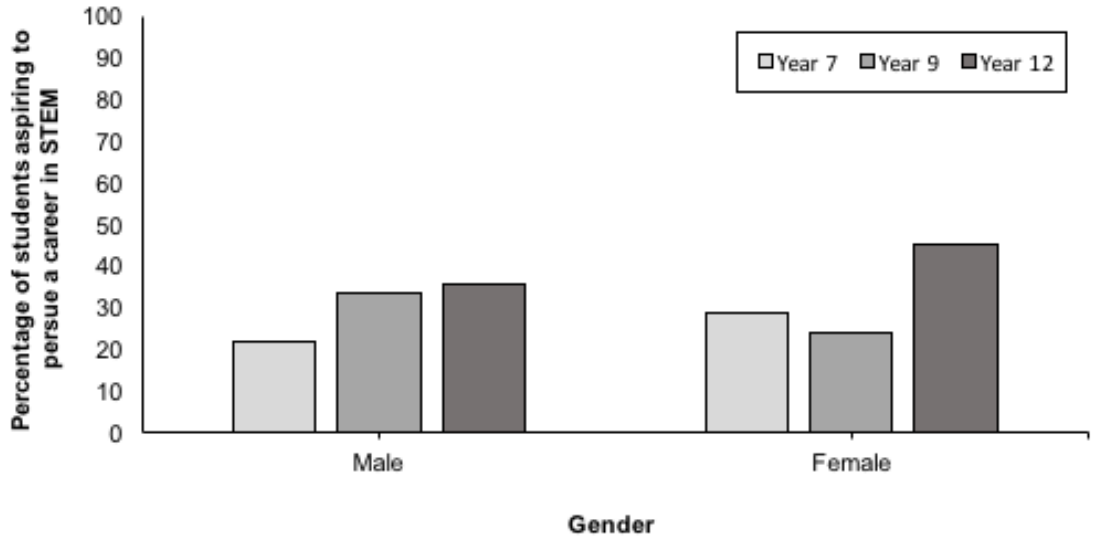

Figure 3. Percentage of male and females who reported that they aspire to pursue a career in a STEM discipline. Note. Data has been collapsed across schools.

Relationship between subject choice and STEM careers

Students taking more STEM subjects for GCSE (M = 1.25, SD = 0.98) are more likely to want to pursue a STEM career than students taking less STEM subjects for GCSE (M = 0.98, SD = 0.93); $t(233) = 2.13$, $p = .034$. A significant effect on the decision to pursue a STEM career was not seen between the students taking more (M = 1.37, SD = 1.31) or fewer (M = 1.46, SD = 1.39) STEM subjects for A Level; $t(67) = 0.27$, $p = .79$.

Parental encouragement in STEM

Both males (M = 15.77, SD = 3.24) and females (M = 16.06, SD = 2.98) felt that they received encouragement from their parents to do well in STEM; $t(318) = 0.85$, $p = .398$. Similarly, non-significant effects were seen between students in Year 7 (M = 16.18, SD = 3.29) and Year 9 (M = 15.52, SD = 2.85); $t(321) = 1.89$, $p = .059$. Finally, our analysis of this scale showed no significant differences between the parental encouragement perceived by the students in School 1 (M = 16.03, SD = 3.08), School 2 (M = 16.03, SD = 2.79), and School 4 (M = 15.54, SD = 3.47); $F(2) = 0.77$, $p = .466$.

Understanding of Horizon Nuclear Power

Understanding of Wylfa Newydd project. This analysis included the responses to the statement "*I have a good understanding of the Wylfa Newydd project and Horizon Nuclear Power*". A Kruskal Wallis test showed a significant difference between schools; $\chi^2(3) = 75.69$, $p < .001$. We explored this effect further, using pairwise comparisons. A significant difference existed between School 1 and School 2 ($p < .001$); School 1 and School 4 ($p < .001$), School 1 and School 3 ($p = .001$); and School 2 and School 3 ($p = .014$). The mean ranks are displayed in Table 5.

Table 5

Mean Rank Data for the Statement About Understanding of The Wylfa Newydd Project

School	Mean rank
1	345.65
2	203.56
3	270.47
4	249.05

We explored the within-school data further. Within School 1, no significant differences existed between the self-reported understanding of Year 7 (mean rank = 108.57) and Year 9 (mean rank = 99.39) students; $\chi^2(2) = 1.30$, $p = .254$. Understanding also did not differ between males (mean rank = 108.34) and females (mean rank = 100.17); $\chi^2(1) = 1.03$, $p = .311$.

Within School 2, we identified a significant effect of year group on the understanding of the Wylfa Newydd project; $\chi^2(2) = 12.98$, $p = .002$. A pairwise comparison showed that students in Year 7 (mean rank = 79.16) self-reported a higher level of understanding than students in Year 12 (mean rank = 59.88); $p = .002$. Understanding was not significantly different between males (mean rank = 71.01) and females (mean rank = 66.52); $\chi^2(1) =0.48$, $p = .488$).

Finally, within School 4, there were no significant differences between the self-reported understanding of the year groups; $\chi^2(2) = 4.233$, $p = 1.20$. We did not find any statistical differences between the understanding of males (mean rank = 59.45) and females (mean rank = 69.55) students; $\chi^2(1) = 2.56$, $p = .110$.

Understanding of the opportunities offered through the Wylfa Newydd project. This analysis includes the responses to the statement "*I have a good understanding of the opportunities Wylfa Newydd will offer to young people (through Horizon Nuclear Power)"*. Our first analysis revealed a significant difference in the self-reported understanding of

students in different schools; $\chi^2(3) = 40.08$, $p < .001$. A series of pairwise comparisons revealed that these differences existed between School 1 and School 3 ($p < .001$); School 1 and School 4 ($p = .034$), School 2 and School 3 ($p < .001$); and School 2 and School 3 ($p < .001$). We have displayed the mean ranks for this analysis in Table 6.

Table 6

Mean Rank Data for the Statement About Understanding of The Wylfa Newydd Opportunities

School	Mean rank
1	340.81
2	195.77
3	298.73
4	244.31

Within School 1, students in Year 7 (mean rank = 111.48) reported a greater understanding of opportunities than students in Year 9 (mean rank = 96.37); $\chi^2(1) = 4.08$, $p = 0.43$. Additionally, the difference between male (mean rank = 115.59) and female (mean rank = 94.62) understanding differed significantly; $p = .009$.

Within School 2, we found a significant difference between the self-reported understanding of year groups. A pairwise analysis revealed that Year 7 students (mean rank = 81.24) reported higher understanding than the Year 9 students (mean rank = 81.24); $p < .001$. Additional significance was found between students in Year 7 and Year 12 (mean rank = 56.88), $p = .049$. When analysing the influence of gender, no differences were found between males (mean rank = 73.77) and females (mean rank = 63.39); $\chi^2(1) = 2.545$, $p = .111$.

Finally, within School 4, we found a significant effect of year group on the understanding of opportunities made available by Wylfa Newydd. Pairwise comparisons revealed that students in Year 7 (mean rank = 74.56) reported significantly higher understanding than students in Year 9 (mean rank = 57.84); $p = .046$. With regards to gender,

we found that males (mean rank = 55.62) reported a higher understanding of Wylfa opportunities than females (mean rank = 72.25); $\chi^2(1) = 6.85$, $p = .009$.

Results: Qualitative

Theme 1: Reasons for continuing STEM

Students reported several factors that increased the appeal of STEM subjects. Regardless of level (i.e., GCSE or A Level), students continued to study STEM because they enjoyed the subjects and were interested in the topics. Students also considered how useful the subject knowledge would be in their future lives and careers.

> "They are the most useful for my future ambitions, and I enjoy them" (Year 9 student)

> "[I chose STEM subjects] because these subjects are part of our daily lives and as we grow older we realize that these subjects separately or combined are important in society." (Year 9 student)

We noted four key drivers that specifically influenced A Level subject choice. Firstly, Year 12 students are highly motivated by their career aspirations. As a result, they choose subjects that they need for, or will be beneficial in, their desired career. Similarly, students took A Level subjects that they believed would lead to a place on a preferred university course. Previous attainment in GCSE subjects also influenced the uptake of STEM subjects at A Level. That is, if a student had excelled in STEM in the past, they reported that they were more likely to pursue it for A Level. Finally, students reported that the problem-solving aspect of STEM and its challenging nature made the subject more appealing at A Level.

> "[I took maths for A Level] because I enjoy the challenge (as it's quite hard) I'm quite good at it" (Year 12 student)

> "I feel that I am quite good at Maths. I enjoy problem solving" (Year 12 student)

> "It could help my chances with future university application, it also applies to many of my chosen subjects" (Year 12 student)

Theme 2: Reasons for discontinuing STEM

We asked students why they did not choose to study STEM for GCSE and/or A Level. In response to this question, students reported factors that contrasted those mentioned above. Specifically, students associated disengagement with lack of enjoyment, a dislike for the subject, earlier low attainment, and a perceived lack of future relevance. In addition to these factors, students reported that they did not continue studying STEM because they did not have an interest in the topics, believed it would be too difficult, and perceived the workload to be too high.

> "I did not enjoy science, and I found it rather difficult" (Year 9 student)
>
> "It does not interest me and it is not particularly relevant to my future career" (Year 12 student)
>
> "[I'm] not looking to become a maths teacher, accountant, or economist" (Year 12 student)
>
> "[I did not take science for GCSE because] I believed it would be too much additional work for a subject I am not that particularly interested in." (Year 12 student)

Several females noted that they did not take engineering for GCSE or A Level because it was a male dominated subject. Not all schools in North Wales have the capacity or resources to offer an in-house engineering qualification. As a result, students wanting to pursue an engineering qualification must travel to a local college. The need to travel acted as a deterrent for studying engineering.

> "[I did not take engineering for GCSE] because we don't have the lessons in school so we have to go to college to do it and it would be full of boys" (Year 9 student)

Our analysis identified that students may disengage in STEM due to their perception of the class teacher. Individuals shared negative stories about how teachers influenced their decision to not take STEM subjects for GCSE. For example, some students did not like the

attitude their teachers expressed towards students and others felt that they did not explain the work properly.

> "I wish I did [take technology for GCSE], but the teacher put me off" (Year 12 student)

> "[I did not take technology for GCSE because] the teacher was arrogant and when I told him I was thinking of doing RE he asked "Why, do you want to be a priest?". This upset me and put me off the subject I enjoyed" (Year 12 student)
> In some schools, students pick their GCSE subjects using a column system.

This system requires them to choose one subject per column, to avoid timetable conflicts. As a result, some students felt the need to prioritise other, non-STEM subjects, for GCSE. Our analysis revealed this to be a key driver behind students disengaging in STEM. Not taking a subject for GCSE prevented students from wanting to take it for A Level. This may also suggest an escalatory effect of the column system.

> "Because I enjoy them and I feel like I am good at them, the columns in the school subjects did not allow me to do geography" (Year 12 student)

Theme 3: The importance of studying STEM

Many of the students who completed this survey showed an appreciation for how important it is to study STEM. They could identify that STEM skills and knowledge apply to everyday life; yet, few provided specific examples of its applications. Students associated getting good grades in STEM with a variety of job opportunities. They showed an awareness of the fact that many jobs have specific entry requirements, including a pass grade in maths and science. Additionally, students alluded to the fact that studying STEM at school has long-term implications. They expressed that doing well in STEM can lead to a better job, a place on a university course, and materialistic gain (e.g., you can earn more money and buy a bigger house).

> "I think it is important [to do well in STEM] because you use maths almost everywhere, Science will help you in the future (especially if you want to be something like a scientist) technology is handy to look something up and engineering is fun" (Year 7 student)

> "[I choose science A Level] because I like learning about the reasons why things work and how they apply to everyday life." (Year 12 student)
>
> "[STEM] is important because these subjects teach many skills useful for every day life." (Year 9 student)
>
> "I think it is important to do well in stem because they are one of the most important subjects in school, and you need these subjects for a variety of jobs and occupations." (Year 9 student)
> "[It is important to do well in STEM] to get good jobs and go to university" (Year 7 student)
>
> "In my opinion it is good to do well in STEM because you need all of them to get a good job, and if you get a job you will get paid and if you get paid you get a nice home, car and a lot of food" (Year 9 student)

Discussion

The development of a strong STEM skillset is becoming increasingly more important in modern society. Despite the everyday relevance of STEM knowledge and skills, such as problem solving and critical thinking, many students choose to stop studying at the age of 14. In the current study, we aimed to further understand some of the factors that may be influencing the uptake of STEM subjects and careers post-14. A secondary aim of this research was to find the extent to which students in North Wales had contacted Horizon Nuclear Power's promotion material.

In the past, terms such as "nerd" and "boffin" were used to insult individuals who excelled in STEM disciplines (McArthur, 2009). The students in this study did not agree with this connotation, and did not perceive people who do well in STEM as nerdy. This could be a result of a societal shift in the use of colloquial labels for people who are intelligent (Reagle, 2015). To illustrate this shift Inness (2016) refers to the development of a "geek chic" culture; whereby looking intelligent has become a desirable fashion trend. Furthermore, the term "nerdy" may be outdated and is no longer used by teenagers in society. Archer et al., (2014) suggested that the prevalence of this term was overstated; with the teenagers interviewed in their study claiming that scientists are "normal" and no different to "everyone

else". This indicates the need for a more in depth and complex approach of assessing the true stereotypes, if any, that students hold around people who excel in STEM.

Another mechanism that might explain this shift, is the subjectivity involved in defining grades (Putwain, Symes, & Remedios, 2016). In the present study, students were to rate their STEM grades on a Likert-scale, ranging from strongly disagree to strongly agree. A future adaption of this research could map a student's empirical attainment to their perception of a "good grade", and their opinion of STEM. If this attitudinal shift is consistent across demographics (e.g., culture, gender, and age) then students may be less likely to strategically underachieve, as they will not engage with the stereotype threat paradigm.

Most students in this study reported that their parents encouraged them to do well in STEM subjects at school. Previous research has shown that parental encouragement is a key driver in academic success (e.g., Murphy, 2017; Tavani & Losh, 2003). We asked students if they felt that their parents encouraged them to do well in STEM, but did not define what "parental encouragement" might entail. For example, parental encouragement might involve verbal encouragement, help with homework, or clear parental goals (Jeynes, 2016). By defining this variable further, it may be possible to pinpoint what aspects of parental encouragement drive children to succeed in academic disciplines, including STEM. In a wider context, identification of these variables may help to inform programmes aimed at fostering parental involvement in education.

The Year 12 students voiced the impact their earlier attainment in STEM subjects had on their decision to pursue the subject at A Level. This highlights the importance of ensuring that children are supported to achieve their potential in their GCSEs. To do this, educational providers may want to consider the use of evidence-based tools to help remediate skill deficits in STEM disciplines. For example, precision teaching (PT) is a measurement approach used to decide if individuals can perform skills with speed and accuracy (Binder &

Watkins, 1990). When coupled with the Say All Fast Minute Every Day Shuffled (SAFMEDS) procedure, PT can effectively increase the basic STEM skills of school-aged children (e.g., Hunter, Beverley, Parkinson, & Hughes, 2016). Fostering effective intervention strategies throughout the Welsh education system—from primary through to secondary stage—could help prevent cumulative underperformance. This could have long-term impact on student attainment at GCSE and A Level, and affect later subject pursuit.

We were successful in naming several key themes linked to the uptake and discontinuation of STEM subjects. When considering the continuation of STEM subjects, students reported that enjoyment, interest, and relevance of subject knowledge was important to them when deciding which subjects to take for GCSE/A Level. Other researchers also revealed these factors in relation to the uptake of STEM subjects (e.g., ASPIRES, 2013; Bowyer & Carrol, 2016; Sheldrake, 2016). This consistency may suggest the reliability of these factors in predicting subject uptake. The motivation of A Level students focused more on the applicability of these subjects in the future (i.e., their career or university course). White (2006) argued that there has been a cultural and societal shift in post-16 pathways. In the 1960s, most young people left school and directly entered the workplace. Now, students are much more likely to pursue further and higher education before they enter a career. In the UK, students need to meet specific entry requirements to gain a place on their desired university course (UCAS, 2017a). This may explain why students prioritise their A Level subjects, to fulfil these requirements, and take the next step towards their career goal.

This research was also successful in highlighting some key themes behind the discontinuation of STEM subjects at GSCE/A Level. Some of the female students were deterred from taking engineering as they perceived it as a male-dominated subject. Madara and Namango (2016) revealed that there are still a disproportionate number of females studying engineering disciplines compared to males, worldwide. Over recent years, there

have been several campaigns aimed at decreasing the stigma associated with females studying engineering; such as WISE (2017). Young, Young, and Paufler (2017) presented several components of enrichment schemes that can foster STEM participation. This includes increasing academic attainment, particularly amongst minority groups; highlighting the relevance of STEM in the surrounding culture; and offering purposeful out-of-school STEM enrichment activities. Employing these methods may help to reconstruct students' views in relation to studying STEM subjects within high school. Consequently, this may reshape career aspirations and increase participation in STEM careers. Further research may be able to gain a more holistic insight into the successful components of STEM enrichment activities, aimed at increasing participation.

A salient theme that came from our survey was that students were less likely to take STEM subjects for GCSE/A Level if they held a negative perception of the class teacher. This is in line with earlier findings (e.g., Asbury & Plomin, 2017; Osborne, Simon, & Collins, 2003). Teachers play an important role in offering emotional support to students whilst they make decisions about what to study (Ruzek et al., 2016). There are notable effects when teacher support is withdrawn, such as students disengaging in the subject (Pitzer & Skinner, 2016). Students in the current study reported the impact that a teachers' attitude can have on their decision to pursue STEM post-14. Together, this research offers evidence to suggest the driving influence of teachers when students are making educational decisions. The implications of this may shape the way in which teachers interact with their students, to create an inspiring and nurturing classroom environment.

Alongside these discontinuation factors, students reported that they perceived STEM subjects to be too difficult or the workload to be high. This perception influenced several students to stop studying STEM subjects at GCSE/A Level. Earlier research found that students rate courses lower if they perceive them to be too difficult and/or to have a higher

workload; with students rating natural sciences amongst the lowest (Centra, 2003). If this is a misconception within education, it should be discussed by key influencers in the field (e.g., teachers, parents, peers). On the contrary, if STEM subjects are more challenging in their nature then it may be a worthwhile exercise to promote the benefits of studying these subjects. For example, studying STEM gives individuals the opportunity to develop their problem solving and critical thinking skills (Becker & Park, 2011). These skills are transferable to many other disciplines and careers, and are sought after by employers (Desai, Berger, & Higgs, 2016).

The students showed that they have an appreciation for the importance of studying STEM during school. Our results show that high school students acquire a view that studying STEM has important implications in terms of careers. Individuals leaving formal education will often need to hold a maths qualification upon application for a job. For those wishing to pursue further or higher education, they will also need a statutory pass grade in maths (UCAS, 2017b). Feldon, Maher, Roksa, and Peugh (2016) highlighted the importance of early maths achievement in the context of later STEM performance. Their paper explains the cumulative advantage that STEM achievement can have through education, with higher-level university students possessing the most advanced STEM skills. These skills are highly desirable amongst the graduate-level workforce. Together this shows the advantages of studying STEM during high school, even if students do not wish to pursue a career directly related to a STEM discipline. Despite appreciating the long-term implications of STEM, few students in the current study could list the everyday application and relevance of STEM. McDonald (2016) presented evidence to suggest that a driving factor in disengagement from STEM is a perceived lack of relevancy to students' everyday lives. Thus, students should learn the value of STEM both inside the classroom and in their everyday lives—whether that be taught in schools, at home, or through enrichment projects (Attard, 2011).

Uptake and attainment in STEM subjects can affect the careers that students can pursue after they finish their training. This is relevant in the context of Horizon Nuclear Power—a company aiming to recruit a stream of suitably skilled individuals (Horizon Nuclear Power, n.d.). Horizon Nuclear Power has taken an active role in some of the schools involved in this research (with School 1 and School 2 receiving the most input). Part of their work involves promoting the opportunities that will become available through the Wylfa Newydd Project. This offers students an opportunity to work within the nuclear sector and contribute to the local community (Horizon Nuclear Power, n.d.; Horizon Nuclear Power, 2017c). We found that the two schools that received the most input from Horizon Nuclear Power reported the highest level of understanding of the Wylfa Newydd opportunities. This suggests that there has been a positive, and desirable, output from Horizon Nuclear Powers' promotion efforts. Further research could explore which aspects of their promotion techniques are most effective (e.g., visits to schools, posters, online advertisements).

This study was successful in identifying several factors that influence GCSE/A Level subject choice (e.g., column selection system, lack of enjoyment, and previous attainment). We were also able to provide Horizon Nuclear Power with information about the contact the sample have had with their materials. However, the results from this research such be taken tentatively, as we were only able to send the survey out to four schools in North Wales. This may limit the generalisability of the results to other schools and differing education systems. If this project could have been conducted over a longer timescale, it may also have been beneficial to pilot the study before sending it out on a larger scale. This would have enabled us to eliminate or reword questions with low internal reliability.

In summary, there has been a decline in the number of students in Wales studying STEM subjects post-16. This study aimed to add to the existing literature and broadly examine some of these factors in schools across North Wales. We have been successful in

identifying a range of factors that influence the uptake and continuation of STEM subjects post-16, and gaining an insight into students' awareness of Horizon Nuclear Power. Further research in this area can help to develop understanding of the key drivers behind STEM participation in high school and thereafter. These developments will help inform schools, STEM businesses, and enrichment programmes in the best ways to improve their delivery of STEM initiatives.

Study 2: What influences high school students to engage in STEM? A qualitative analysis of perceptions, external influence, and career opportunities

This exploratory study aimed to gain further insight into some of the factors discussed in study 1. Using focus groups, we explored the stereotypes that students hold relating to STEM professionals, factors that students believe influence their educational decisions, and student views on Horizon Nuclear Power.

Methods

Sample

Students from one school on the Isle of Anglesey took part in the focus groups. Separate focus group sessions ran for Year 7 (ages 11-12; n = 12; 4 males; 8 females) and Year 9 (ages 13-14; n = 13; 10 males; 3 females) students.

Ethics

This project gained full ethical approval from the Bangor University Ethics Committee (application number: 2016-15861). In the first instance, the head teacher of the school gave consent for this research to take place. After gaining school consent, an information sheet and parental consent form was sent out. Return of this form allowed the student to take part in the focus groups. Student assent was monitored throughout the session. Identities have been anonymised throughout this report.

Setting

The focus groups were conducted in a classroom in the students' own school. Most of the session took place around a large rectangular table, except when evaluating the Horizon Nuclear Power website. For the latter task, the students' gathered at the front of the room so that they could see the website on a projected screen.

Separate focus group ran for the Year 7 and Year 9 students'. Due to school timetabling and room allocation, the sessions ran concurrently by two different researchers. Both researchers were well informed about the aims of the research and discussed the pre-

determined topics outlined in Appendix I. The sessions lasted 42 min 52 sec and 43 min 1 sec (Year 9 and Year 7 respectively).

Before the students arrived, the researchers arranged the room to accommodate for the two groups. Placed in the centre of each table was an array of pencils, coloured pens, and plain A4 paper. Once the students had sat down, the researchers outlined the study and explained how the focus group would run. If the students had anything to contribute to the discussion topics then they spoke into a Dictaphone.

Draw a scientist task (DAST). As an icebreaker activity, the students drew a scientist using the materials provided. The researchers gave little instruction when introducing this task, in order to prevent any priming effects. After five minutes, students were asked if they would like to explain what they had drawn to the rest of the group. This activity aimed to capture some of the stereotypical features that students associated with being a scientist. The final drawings are displayed in Appendix J.

Stereotypes task. This task used a line-up of 10 head shots (see Appendix K). These photographs varied in gender and ethnicity. Each had a number in the bottom right corner for ease of transcription. The researcher asked the students which of the people shown in the photographs was most likely to be a scientist, technician, engineer, and mathematician. As a group, the students had to come to a decision about which model filled each role—thus encouraging discussion and justification. This task aimed to offer further insight into the stereotypical characteristics that students associate with STEM professions.

Influence on subject choice. To explore students' views about the subjects that they choose to study at school the researchers asked them to discuss two topics. The first topic needed the students to think about the subjects that they choose to study at school. This broad question aimed to capture personal factors relating to subject uptake. The second specifically

focused on external influence. Prompts were delivered to help discussion if deemed necessary (i.e., “do you think your teachers have any influence? If so, in what way?).

Horizon Nuclear Power. A section of the focus group aimed to collect feedback, from the students, on the Horizon Nuclear Power webpage (see: http://horizonnuclearpower.com). A member of the group volunteered to look around the webpage and click on anything that the group wanted to explore. A projector enlarged the webpage for the whole group to see. We encouraged the students to explore the secondary education section of the webpage thoroughly.

We were also interested in collecting student views about the Wylfa Newydd project and the promotion work of Horizon Nuclear Power. Students discussed both topics, giving details of advantages, disadvantages, and their personal experiences. This included talking about events in which Horizon Nuclear Power had attended to promote their opportunities.

Skill development and careers. Students discussed the methods in which they can develop their skills after they leave school. This discussion topic aimed to assess if students are aware of the qualifications they can gain (e.g., A Levels, BTEC, degrees) and any schemes that can help them develop industry-skills (e.g., apprenticeships). To compliment this, we asked the students to discuss their knowledge of the local job opportunities that might be available once they leave school.

Exit question. At the end of the session, the students had an opportunity to discuss anything that they did not have a chance to say. This could have been ideas that they had thought of during discussion or anything related to STEM subject choices and careers. The session concluded after any final points had been discussed.

Data analysis

An inductive analysis revealed the common characteristics drawn by the students in the draw the scientist task. Recurring physical features were noted in a table (see Appendix

L). We classified a feature as an emergent theme if it was seen in 50-percent, or more, of the pictures in each group.

A thematic analysis explored the themes amongst the students' views and experiences, as expressed during the focus group. Braun and Clarke (2008) outlined six stages associated with a thematic analysis. We used these stages to explore the important themes within the data that related to the research question. In this case, we were interested in students' views and experiences of STEM and Horizon Nuclear Power. To start the familiarisation process, a researcher transcribed the verbal data into a written form (see Appendix M). Further familiarisation came from thoroughly reading the full transcripts twice. After generating a list of key ideas from the transcripts, a researcher assigned codes to the features of the data that appeared interesting (for an example, see Table 7).

Table 7

An Example of the Codes Applied to a Segment of Data During Thematic Analysis

Data extract	Coded for
It's because the equipment that we have, and also with ICT, information technology, it's good to have some nice computers. In this school we are lucky to have some nice computers in the schools and I guess it's sort of the feeling as well, and the teachers, and also the equipment you have to work with. (Year 9 student, male)	1. Appeal of equipment 2. Teachers

Following the coding exercise, the researcher considered how the codes related to each other, to form an over-arching theme. After review and refinement, the themes formed a final thematic map, which captures all the salient segments of the transcripts (see Figure 4). Finally, we finalised the narrative that supported these themes, to present for write-up.

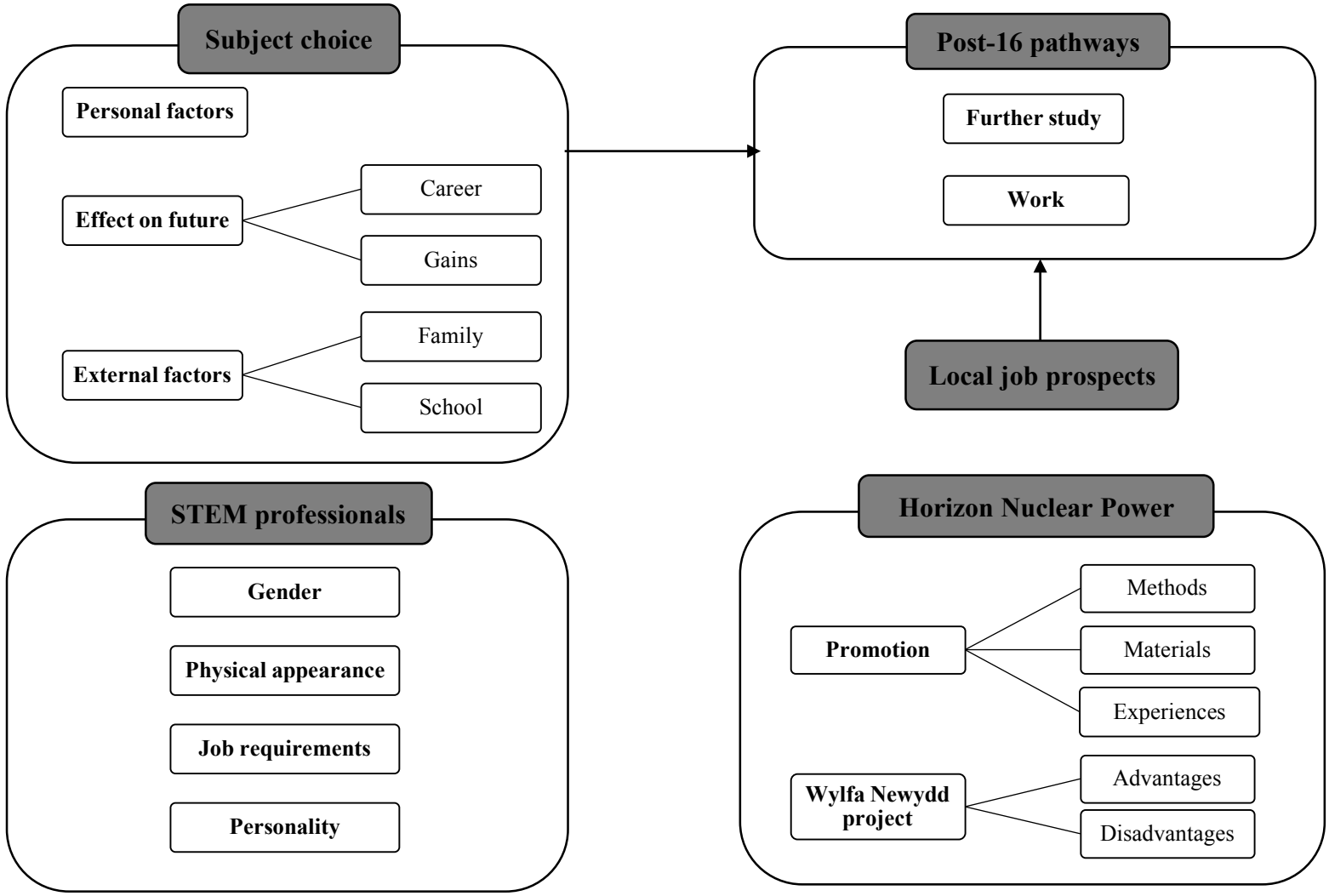

Figure 4. Final thematic map *sh*owing the five themes extracted from the focus group transcripts

Results

The results section of this report forms two parts. The first presents the analysis of the drawings created for the draw the scientist task. The second outlines the themes derived from the thematic analysis of the transcripts.

Draw a scientist task

Year 7. An inductive analysis found four emergent physical characteristics that the Year 7 students associated with being a scientist. All the pictures depicted a male character. Many of these characters had facial hair, were dressed in a lab coat, and were pictured with chemicals/test tubes. An example of one of the pictures can be seen in Figure 5.

Figure 5. An example of a scientist drawn by a Year 7 student

Year 9. Several key characteristics emerged across the Year 9 students' pictures. All but one of the students drew the scientist as a male. Recurring characteristics amongst this group were: lab coats, chemicals/test-tubes, glasses, facial hair, and a balding head. An example of one of the pictures can be seen in Figure 6.

Figure 6. An example of a scientist drawn by a Year 9 student

Theme 1: STEM professionals

The students held stereotypes about what a scientist, technician, engineer, and mathematician may look like. Several of the students claimed that the people in the photographs "look like" a STEM professional, but only some could justify which features suggest their profession. The terms used to describe the professionals fell within three broad categories: what they look like, what their job entails, and their personality traits. Below is an outline of how the students viewed people in each STEM career.

Scientist. The Year 7 students viewed a scientist as someone who uses chemicals, conducts experiments, does not dress in a "posh" fashion, is lonely, and has a "whacko"

personality. The Year 9 students placed focus on the physical appearance of a scientist (i.e., hair style, facial hair, wears glasses). To these students' scientists use beakers, are "smart", and are less happy.

> "My picture is about a whacko scientist trying to make a potion out of scientific chemicals that makes him attractive because he's a loner. –laughter-" (Year 7 student)

> "I have done it like this because this is how I picture the - - a scientist in my head is seen as the word scientist pops into my head. And that's about it. I mean obviously I know they don't all look the same, but most of them do, so." (Year 9 student)

Technician. Little discussion took place when deciding which of the models was most likely to be a technician. During the Year 7 focus group, one student remarked that a technician looks like they are good with computers. The Year 9 students approached this task with a different focus. A student in this group claimed that one of the male models, in the photographs, looked like the technician employed in their school. Interestingly, both year groups suspected the same model (see figure 7) fulfilled the technician role.

> "I think number 2 is a technician because he looks good with computers. I don't know why." (Year 7 student)

> "Ok. I think number 2 is the – my name is _____ - -er is the engineer because he looks - - the technician even because he looks a lot like the technician we have in this school and he's wearing a little black jacket probably, so that means he is the technician." (Year 9 student).

Figure 7. Students in both year groups suspected that this model might be a technician. *Image retrieved from https://digital-photography-school.com/10-tips-for-photographing-great-headshots/*

Engineer. When naming who was most likely to be an engineer, both groups referred to the physical characteristics of the models. The idea of wearing less formal clothes was a commonality across both transcripts. Additional stereotypes held by the Year 9 students were that engineers are physically strong and can do practical work.

> "I think number 2 is the engineer because he isn't wearing anything smart. He's wearing more casual clothes than a scientist or mathematician. So yeah, he's probably the engineer." (Year 7 student)

> "I think number 9 is an engineer because she doesn't look as formal as the other. No, because engineers do like practical work as well." (Year 9 student)

Mathematician. Both year groups made an association between being a mathematician and wearing glasses. In terms of personality, a Year 7 student claimed that the person in the photograph looked as if he enjoyed maths. Whereas, the Year 9 students thought looking clever and sophisticated are characteristics of a mathematician.

> "He's got glasses and he looks like a mathematician and he looks like he likes maths." (Year 7 student)

A theme that came up in both transcripts was the idea of familiarity. That is, the students thought that the models in the photographs looked like somebody that they knew. In both cases this familiarity linked to a teacher in the school, who worked in a STEM field (i.e., the school technician and a science teacher).

> "I have drawn my favourite teacher, Mr _____, who happens to be a science teacher." (Year 7 student).

Finally, our analysis revealed gender to be a sub-theme associated with professionals in STEM careers. This was salient within the Year 9 transcript. During the stereotypes, one of the girls in the group made a remark about how many male photographs had been selected. She claimed that this bias was sexist and "not everything is a man". Later, we asked the group how they felt about the promotion of a woman as a professional in a STEM role. A boy argued that gender should be irrelevant in the appointment of a professional to a role. He

continued to explain that a person's level of qualification was more important. This was an argument widely accepted amongst the group.

> "When it comes to the role of gender in STEM jobs, in my opinion it should have nothing to do with gender and everything to do with qualifications. Just because someone is a woman, or maybe just because someone is a man, they don't - - they aren't entitled to employment because they are different to- - because they have a different gender. Of course, if a woman has certain qualifications then she has every right to get that job. Again, it has nothing to do with gender. It should have everything to do with qualifications, and nothing can really change that." (Year 9 student).

Theme 2: Subject choice

There are several personal factors that the students used as rationale for choosing which subjects to take in school. The students reported that they were more likely to choose a subject that they enjoyed over one that they disliked. Additional factors reported by the students included their academic ability in the subject and whether they had a raw talent in the discipline.

> "if you like the teacher you're most likely study that lesson - - study that lesson in GCSEs and stuff." (Year 7 student)

> "it depends on - - for most people who go for the logic, if you aren't very good at a subject, such as - - yeah art, yeah definitely, then I'm not going to pick art. And if there is something that you like, like engineering, then engineering is a good way to go. But, that is completely different if someone is good at art or singing or something then they wouldn't go into engineering." (Year 9 student)

The students reported that their family played an important role in influencing the subjects that they study at school. Specifically, one student commented on how a parent's career choice can influence educational decisions. They stated that if parents specialise in a particular field, then their child may also take an interest in what they do and aspire to pursue the same career path. To pursue this path, students may need to take, or be interested in, specific subjects at school.

> "- I reckon the reason is for you to choose the subjects that you have is effects on what your mum and dad work as. So, if your mum and dad work as an engineer, then you might be interested in being an engineer, or something like that, for example." (Year 9 student)

Our analysis also revealed several in-school factors that influence subject choice. A student claimed that they were more likely to take a subject if they liked the teacher who taught it, and the way in which that teacher delivers the lesson. The quality of available equipment also appeared to be a factor that influenced uptake. Attraction to relevant equipment (i.e., computers for information technology lessons) may affect a student's likelihood to take the subject for GCSE or A Level.

> "I think that the teachers can influence your future because if you like the teacher you're most likely study that lesson - - study that lesson in GCSEs and stuff." (Year 7 student)

> **"**It's because the equipment that we have, and also with ICT, information technology, it's good to have some nice computers. In this school we are lucky to have some nice computers in the schools and I guess it's sort of the feeling as well, and the teachers, and also the equipment you have to work with." (Year 9 student)

The final sub-theme discussed was the long-term consequences associated with high school subject choice. Students, in both groups, claimed that there are long-term rewards that can come from making good educational choices. These include getting a good job, earning lots of money, and having a better quality of life. A Year 9 student made a salient comment about choosing subjects at school that are useful outside of the classroom. Some subjects might be more practical, in terms of everyday tasks and future careers, than others.

> "I have quite stern opinions when it comes to –laughs- when it comes to what you are choosing at school. Like, if you are choosing something because you think it's fun it's not going to be very beneficial in life. You have to really think about what is going to be helpful, more than it being fun. I didn't really want to choose geography, but I did because it is more practical then like choosing something that isn't. You know? - - Art - - I wasn't going to say anything, but, art." (Year 9 student)

> "Probably my nain and taid, and my dad's brothers, because they all did engineering and it's so much easier to get a job in engineering now because there are not enough of us in the UK. And also, with the new Wylfa developing there is a lot of jobs coming up with that, which I hope to apply for with Horizon." (Year 9 student)

Theme 3: Post-16 pathways

Part of the focus groups aimed to gain an insight into what students know about post-16 pathways. In terms of depth of knowledge, there was a clear distinction between the two

year groups. The Year 7 students could briefly outline a further study pathway, but the Year 9 students were able to name specific qualifications (e.g., A Level, BTEC, degree).

> "I think that you can go to college, and then pass college and then go to university." (Year 7 student)

> "With A levels, you will progress at a higher level of standard of work, and you can also reach for the higher jobs, such as the senior engineering manager, or whatever it was. You can sort of aim for stuff like that. With GCSE they also - - I know Horizon does an apprenticeship, which _____'s cousin has got. Anyway, I know that they offer apprenticeships after GCSE level to teach you and then you will work for the nuclear company." (Year 9 student)

The Year 9 students showed clear acknowledgement of several educational pathways. However, not all the information relayed during the session was correct. We could identify that one student held a misconception about BTEC qualifications. He believed that BTEC qualifications are easier to gain than GCSEs, and are less sought after in modern society.

> **"**BTEC is the - - well, now BTEC isn't really worth as much as a GCSE is. No, a BTEC isn't worth anything close to a GCSE, if I'm correct. Erm so, with the college courses, that they offer, they are all BTEC. Which I don't think is sort of right. I think they should do GCSE level work, for those people who want to progress in that because when picking the Level 2 engineering, or something, it is all BTEC. Which doesn't - - Obviously, you get a qualification, but the BTEC isn't actually worth as much in today's time." (Year 9 student)

Theme 4: Local job prospects

Both groups believed that staying on the Isle of Anglesey after they finish school would limit their job prospects. The students believed that the most ambitious jobs available to them, if they stayed on the Isle of Anglesey, would include working in a shop or in a family trade. Despite the potential of upcoming roles on the Wylfa Newydd site, the Year 9 students showed negative feelings towards applying. Out of the 13 Year 9 students who took part in the focus group, 12 claimed that they wanted to move away from the Isle of Anglesey after they finish school.

> **"**There are no jobs around" (Year 7 student)

> "there is almost literally nothing on Anglesey for us, I'm out of here when I'm older." (Year 9 student)

> "When it comes to jobs in Wylfa, their aren't really going to be many people from Anglesey who are going to be employed there, because the Chinese are probably better than us in every single way. –laughs- The truth is, like no one really cares. Like, at the end of the day, school kids just play football and like jump for a mile. –laughs- But the thing is the Chinese are taking our jobs" (Year 9 student)

Theme 5: Horizon Nuclear Power

Promotion. Horizon Nuclear Power have made several attempts to promote their work and impact to local schools across the Isle of Anglesey and North Wales. When asked about the events that they have attended, the Year 7 students did not respond. However, the Year 9 students could list several events where they have been able to verbally interact with the employees of Horizon Nuclear Power. The students revealed that they had contacted employees at school-based events, such as parents evening and STEM initiatives. As a result, they could speak face-to-face with employees, ask questions, and hear first-hand about what it is like to work for Horizon Nuclear Power.

> **"**I've been to _____ high school and they have been there, and we have learnt about and had some things from there. Also, parents evening they came around and set up a little booth. Got a lot of free biros there, good ones as well. But, the point is, you had a chat with other people who taking the apprenticeship. It was good to hear their views on the - - and how they enjoy it and stuff. And, what else was I going to say? What was the question again? I kind of forgot." (Year 9 boy).

In addition to attending these events, Horizon Nuclear Power promote the work that they do on their website. The aesthetics of the website received many compliments from the students, specifically about the colour scheme and graphics. For some of the students, this was the first time that they had seen some of the resources that Horizon Nuclear Power offer, such as the career route maps and career profiles. When asked about the usefulness of these resources, the feedback was positive—with the students claiming that the resources would capture their attention and provide them with useful information.

> **"**I think it seems pretty good. I like that there is different colours and that in the top and the background it has the cool design of the different sorts of things, like bolts and stuff in the back. That's pretty cool. And, it's good that they have a background of somebody who actually works, and is a senior engineer, and what they did, and

> what they do, and what they did to get there. And I think - - I have never looked at this before, and I like it." (Year 9 student)

Not all the feedback received about the website was positive. Some of the students made constructive suggestions about what they would like to see improved. One boy commented on the response effort needed to get from the homepage to the resources on the high school section. To improve this, there could be a more direct link to key promotion materials on the homepage. This would reduce the effort students need to put in to find resources that might be useful to them. We received another constructive suggestion about the use of social media to disseminate information. The student felt that certain social media platforms were more likely to capture the attention of an older generation. Other platforms, such as *Snapchat*, might be more appealing to current high school students.

> "I also think that erm it's not - - it's not really, erm - - I don't know how to- - it's not really that appealing to me. If I was - - If I was to go onto this Horizon Nuclear Power, you would have to go to education, then secondary schools just to see this. I think you need a little bit more information about the different things and more - - if we go to the home, like more like the different - - maybe something at the front like the jobs saying the jobs you can get from the ages this to that, and what you can possibly aim to get the qualifications. Rather than at the front - - so that I know that it is there, rather than looking through it, rather than clicking on education, then secondary schools, and then whatever you want to pick to actually get to what you want." (Year 9 student)

> "Yeah, I see that you have twitter, YouTube, and Instagram but where is the Facebook at? I mean, you should have a snapchat too, so it sort of appeals to people of our age rather than people in their 30s. I reckon, yeah." (Year 9 student).

The Wylfa Newydd project. When asked to discuss their views about the Wylfa Newydd project, the students had polarised opinions. For some, the project offered a good opportunity to generate an energy supply. They believed that the project offers an opportunity for long lasting and wide scale effects, which together offer a practical solution to energy demand. On the contrary, some students viewed the new station as a potential target for terrorists—fearing that it may cause damage if a bomb hit it.

> "It's a disadvantage because if terrorists bomb it then –explosion noise- " (Year 7 student)

> "The biggest argument against building Wylfa B is erm, just build some wind turbines. But the thing is, someone did the math, and it would take- - you would have to cover the entire surface area of Anglesey, and part of Gwynedd, with wind turbine to match the amount of power that Wylfa B would make in a day, and that's in a year. The thing is, there is every - - there is almost no con when it comes to building Wylfa B, you've got almost unending source of energy for the entirety of North Wales. There is not really any argument against it." (Year 9 student)

Discussion

Previous research suggests that students hold stereotypes about the types of people in STEM careers. The current study aimed to add to this literature and explore any other stereotypes held by high school students in North Wales. We showed that, on the whole, the students in our study hold stereotypical beliefs about what STEM professionals look like, what their job entails, and their personality traits. Moreover, we outlined some of the potential driving factors behind post-14 subject choice and students' understanding of further education and training. Secondary to this, we also aimed to explore the attitudes of high school students towards Horizon Nuclear Power—a company proposing to build a new nuclear power station on the Isle of Anglesey. It was clear that the students had a broad understanding of what the company do, the opportunities they offer, and what the Wylfa Newydd project would entail. Some of the students were very positive about the company's promotion and work. However, others feared that the Wylfa Newydd project could cause threat to the island.

An array of literature has shown that students are more likely to perceive a STEM professional as male (e.g., Chou, 2015; Master et al., 2016). In the current study, all but one of the students drew a male scientist in the DAST task; implying that these students hold stereotypical beliefs about what a scientist looks like. This may be an important finding in the context of self-image. If a student holds strong stereotypes about what a STEM professional might look like, act like, and what their job entails then it may prevent them from undertaking a STEM-based career. Claiborne and Sirgy (2015) provided evidence to suggest

that if self-image is not congruent with the stereotypical appearance of a group, then people are less likely to perceive themselves as a member of that group. Further studies could investigate the direct mapping of students' self-image to the stereotypes they hold of STEM professionals. For example, they could be asked to fill in one questionnaire about their own personality traits, perceived appearance, and demographics. Another questionnaire could focus on their views about what a STEM professional might do and look like.

Whilst completing the STEM stereotype tasks, two students referred to professionals that they knew within these roles. Having role models within STEM careers can help shape our view of what people in that field might be like (Cheryan, Siy, Vichayapai, Dury, & Kim, 2011). Often, this perception is overgeneralised (Patel & Biswas, 2016), and thus is an inaccurate representation of the diversity in the workplace. This is not to say that the people we meet in our daily lives are solely responsible for the stereotypes that we form. Cheryan, Master, and Meltzoff (2015) argued that popular movies and television shows are partly responsible for the lack of diversity associated with STEM professions. For example, shows such as *The Big Bang Theory* depict scientists and engineers as males, obsessed with technology, and with limited social skills. Whilst the media can form narrow stereotypical views of STEM professionals, it can also be utilised to diversify our representations. Matincic and Bhatnagar (2012) showed the impact of internet campaigns in shaping women's perceptions around the type of people who can pursue careers in STEM. In their research, women were asked to vote for the career that Barbie® should pursue next. A range of media campaigns prompted this decision process, leading for women to vote in favour of a computer scientist Barbie® doll. This illustrates the effects of diversifying the promotion of people who can pursue STEM careers, to help create a more holistic view of the profession. In turn, diverse promotion could work towards preventing individuals disengaging with STEM disciplines at a young age (Matincic & Bhatnagar, 2012).

To pursue a career in STEM, many will need to hold relevant post-14 qualifications, such as GCSEs, A Levels, or diplomas (Royal Academy of Engineering, 2016). This study showed that Year 7 and Year 9 students differ in their knowledge of further training. Year 7 students are aware that education pathways exist after formal secondary education, but the Year 9 students can explicitly name qualifications. As students' progress through their high school education, it is possible that they receive increasing guidance about education and career pathways. For Year 9 students the decision about what to do post-16, whether that be apply for work or further study, is imminent (Careers Wales, 2017b). Whereas, Year 7 students have more time before they make that decision. It may be valid for education providers to consider whether students need to be aware of these pathways at a younger age, so that they can make informed decisions about the qualifications that they want to achieve (Hedges & Speckesser, 2017).

All, but one, of the Year 9 students involved in this study did not foresee staying on the Island of Anglesey to pursue their career. Since 2011, Wales has seen an increase in the number of nationals leaving the country to pursue work. Future projections suggest that the population on the Isle of Anglesey will continue to decrease before 2038 (OECD, 2014). With more people moving out of Wales, the House of Commons Welsh Affairs Committee (2016) expressed concern over the longevity of the Welsh language and culture. The Wylfa Newydd project offers an opportunity to preserve and enhance the unique culture of the Isle of Anglesey. Horizon Nuclear Power aim to work with education providers to train individuals in the local community to excel in STEM. As a result, a growing number of local people will have the skills that they need to apply for a job in the new nuclear power station, and thus stay on the Island (Horizon Nuclear Power, 2016).

Despite Horizon Nuclear Power's efforts to help the community, some residents have shown resistance against the company's plans. In this study, students expressed concerns that

a new nuclear power station may act as a target for terrorists. It is worth noting that these focus groups took place shortly after a sequence of terror attacks in the UK (BBC, 2017). The relevance of these attacks may have resonated with the students, in turn prompting feelings of fear towards the new nuclear power station. Replications of these focus groups could highlight whether terrorist threat is a pertinent sub-theme across schools and age group; as opposed to being an effect associated with current news stories.

Horizon Nuclear Power employ several initiatives, aimed at raising the profile of their work. These focus groups took place in a school where Horizon Nuclear Power have been promoting their opportunities, and offering STEM enrichment activities. The results suggest that the company has been successful in captivating the attention of several students, who are interested in pursuing a career in a STEM industry. The Year 9 students gave examples of events where they could interact with employees from the company. These examples were positive and highlight the value associated with physical interactions between students and potential places of work. By creating good impressions and networks, Horizon Nuclear Power may be able to harness the attention of high school students. They can use this promotion to not only demonstrate the advantages of their educational schemes, but also promote the environmental and cultural benefits of the nuclear power station. There are several platforms in which this communication exchange can occur, such as face to face or via a popular social media site.

The focus groups used in this study allowed us to identify some of the factors that influence the participation in, and disengagement from, STEM in high schools. Additionally, we were successful in gaining insight into student views on the Wylfa Newydd project and revealed that some of the students have previously come in context with Horizon Nuclear Power. The sample used in this report was small and thus the results should not be generalised to the wider population of North Wales. A replication of these focus groups, in

other schools, would help to develop these themes further and perhaps reveal different themes amongst the transcripts. Similarly, replication may show that contemporary issues (e.g., terrorism attacks in the UK) play an important role in how students view the Wylfa Newydd project.

To conclude, this study offers evidence to support the contention that students hold stereotypical beliefs about what a STEM professional looks like, behaves like, and what their job entails. If this belief is not congruent with an individual's self-image, then it may offer one explanation for disengagement in STEM disciplines during high school. Future research could support the idea of diverse images of STEM professionals being promoted via the media. Our research revealed a gap in knowledge between Year 7 and Year 9 students, when thinking about post-16 training pathways. Schools and companies may play an important role in promoting different options to children throughout their high school education. This could help younger students make informed choices about the subjects that they want to study. Finally, the results from this study highlight the impact of Horizon Nuclear Power's promotion work in this specific high school. Replications of this research will offer further evidence to support the effectiveness of what they do, and highlight areas of improvement.

General Discussion

The two studies presented in this chapter aimed to support, and expand on, the current literature investigating STEM subjects and careers amongst high school students. This is an important issue within North Wales due to a decrease in the number of high school students participating in STEM disciplines post-14 (OECD, 2016).

With Study 1 and Study 2 employing different research methods (i.e., surveys and focus groups), we could explore a range of qualitative and quantitative data, in different contexts. In doing so, we could establish some consistencies in prevailing themes throughout the research. Both studies were successful in showing some of the factors influencing high

school subject choice. For example, students are more likely to choose to study a subject at GCSE level if they enjoy it, like the teacher, and they perceive it to lead to long-term rewards.

Each study was also successful in exploring some of the broader topics associated with disengagement in STEM. Study 1 specifically aimed to gain a broad insight into factors that may affect subject choice; such as parental involvement, career ambitions, and the importance of studying STEM. Study 2 took a more focused approach, looking more in depth at factors such as stereotypes, key influences, and the input of Horizon Nuclear Power. Together, this research has helped to expand on several key arguments within the literature and provide insight into the views of current students in North Wales.

[Chapter 3] The decision to pursue further STEM training: Exploring the views and experiences of Horizon Nuclear Powers' technical apprentices

Abstract

Apprenticeships allow individuals to develop key skills and knowledge relevant to their chosen workforce. By 2020, it is an expected rise in apprenticeship places in the UK. However, current projections suggest that this demand may not be met. Some disciplines report a higher proportion of vacant apprenticeship places than others, such as science, technology, engineering, and maths (STEM). We interviewed a cohort of apprentices enrolled on the Horizon Nuclear Power Technical apprenticeship scheme, to explore factors relating to the decision to pursue this specific STEM training. A thematic analysis was used to identify five key themes: (1) subject pursuit; (2) career promotion; (3) appeal of the apprenticeship scheme; (4) skills learnt through the apprenticeship scheme; and (5) aspirations. The findings suggest that apprenticeships can be an effective way to develop transferrable skills and factors, such as attainment at school, can make these schemes more appealing. Furthermore, high school students learn about apprenticeships through companies, their school, and parents. Wider implications are discussed in relation to the promotion of STEM carers and apprenticeships.

Introduction

Historically post-16 education, in the UK, has been separated into academic and vocational routes (Maschi, Crawford, & Vignoles, 2010). The academic route is characterised by college-based qualifications (e.g., A Levels), whilst the vocational qualifications are those that are employment-based (e.g., BTECs and apprenticeships). Apprenticeship schemes have shown to be an effective way of helping individuals develop skills that are valued by employers. This includes the development of specific industry skills, knowledge, and behaviours needed to excel in the workplace (Department for Education, 2017. Presently, over 200,000 UK establishments offer apprenticeship schemes, with a predicted rise to 3 million by 2020 (HM Government, 2015; Mirza-Davies, 2016; Pearson, 2016). A new governmental framework aims to put employers at the forefront of apprenticeships, to reduce costs, maximise benefits, and create sustainable schemes. Long term, these changes aim to raise the skill level of students to create a productive and prosperous economy (HM Government, 2015).

Participation in an apprenticeship scheme has several associated benefits, for both the apprentice and their employer (Chan, 2016; Hasluck & Hogarth, 2010). Trainees have noted that apprenticeships offer an opportunity to gain valuable work experience, without the need of going to university and accumulating student debt (Kirby, 2015). Employers often gain the loyalty of their apprentices—with the apprentice deciding to work for the company after completing the scheme. Consequently, the company has access to a stream of employees who hold the relevant skills and experience (Lewis, 2014; Muehlemann & Wolter, 2014). By developing an understanding of what makes an apprenticeship scheme appealing, it may be possible to maximise the success of their promotion (Abdel-Wahab, 2012).

Apprenticeship schemes offer an opportunity for individuals to develop industry-specific skills (Oliver & Wright, 2016). Despite this opportunity being available, projections

suggest that many jobs are vacant because people lack the skills needed to fulfil the role (Hindman, 2016). Certain disciplines show larger shortfalls in skilled individuals than others (Cappelli, 2014). For example, there is a distinct skills shortage amongst engineering professions, with the UK producing 36,000 fewer engineers than it needs each year (MacDonald, 2014; Vivian et al., 2016). These statistics have raised concern in relation to the increasing job demand within the engineering discipline (Bishop, 2017). Engineering UK (2016) proposed that a proportion of these jobs can be occupied by individuals who have completed a relevant advanced apprenticeship scheme. It is believed that action should be taken to increase achievement in science, technology, engineering, and maths (STEM) apprenticeships, with an emphasis on 18- to 24-year olds (Engineering UK, 2016). This ambition could help to reduce the skill shortage gap and achieve the targets of apprenticeship reform, resulting in lower levels of unemployment and the fulfilment of job openings.

Horizon Nuclear Power is a company that aims to promote success in STEM subjects and careers (Horizon Nuclear Power, n.d.a). The company offer a post-16 technical apprenticeship scheme, which offers the opportunity for students to learn the skills that they need to excel in the nuclear energy sector (Horizon Nuclear Power, n.d.b). Over three-years the apprentices learn about four engineering disciplines: mechanical, electrical, control and instrumentation, and electronics and programming. Skills are delivered through the medium of classroom theory lessons, practical work, and visits to relevant facilities (e.g., live power stations). Together, this experience aims to equip apprentices with the knowledge and practical skills needed to work in Wylfa Newydd—the new power station due to be constructed on the Isle of Anglesey (Horizon Nuclear Power, n.d.c). This offers an applied example of how apprenticeship schemes can be developed to form a stream of suitably skilled recruits, in a STEM discipline.

There is ample evidence to suggest that apprenticeships can be advantageous for employers and those enrolled on the schemes (e.g., Chan, 2016; Hoeckel, 2008; Vickerstaff, 2007). However, little research has revealed the drivers behind why high school students might apply for these schemes. The current study aimed to explore some of the motivating factors that may encourage students to enrol on the Horizon Nuclear Power Technical apprenticeship scheme. Specifically, this study aimed to capture a snapshot of the apprentices' experiences, from high school through to current day, with a specific focus on why they chose to peruse a STEM discipline.

Methods

Sample

The sample for this study consisted of 10 students enrolled on the first year of the Horizon Nuclear Power Technical apprenticeship scheme. These apprentices completed their secondary education, to at least GCSE level, in North Wales. A total of eight males and two females completed the interviews (M_{age} = 17.3 years, range: 16-19 years).

Ethics

The Bangor University Ethics and Research Committee granted full ethical approval for this study (Ethics Application Number: 2016-15861). Additionally, the project council and a project solicitor at Horizon Nuclear Power approved all documents—to ensure both quality and accuracy.

To take part in the interviews, the apprentices had to read an information sheet outlining all the key details of the study and return a consent form (see Appendix N). Due to the apprentices still being in education, we also obtained consent from their parent/guardian. The apprentices did not have to answer any questions during that interview that they did not want to and could withdraw at any time without penalty. Names and personal details have been anonymised throughout this report.

Setting and Materials

The interviews took place at the college where the apprentices were completing their training. The researchers invited the apprentices individually into a quiet office and explained that the session would be recorded on a Dictaphone and later transcribed (for full transcriptions see Appendix O).

A research team at Bangor University and an employee for Horizon Nuclear Power devised the structured interview questions. The questions aimed to gain insight into why the apprentices chose to pursue further STEM training and what motivated them to apply for a position on the Horizon Nuclear Power apprenticeship scheme.

Procedure

Before beginning the interview the apprentices filled in a short demographic questionnaire. The interview consisted of seven pre-determined questions (see Appendix P). When necessary, we delivered prompt to encourage the apprentices to give more detail or justification for their responses. If they mentioned anything that was not directly related to the question, but considered valuable in understanding perceptions towards STEM and careers, then we asked further follow-up questions.

Qualitative Analysis

Braun and Clarke (2006) outlined the six stages of thematic analysis. We adhered to these stages to analyse the transcript data and identify themes across the dataset. First, the researcher transcribed the dataset and become familiar with content. A researcher read the transcripts twice without comment. On consecutive readings, a researcher took notes of emerging patterns and key points. This information was used identify meaningful elements from the data (codes); an example of this can be seen in Table 1.

Table 1

Data Extracted from the Apprentice Interview Transcripts and the Corresponding Codes

Data extract	Coded for
I chose triple science because I liked it and I was interested in physics and all. I chose PE because I like sports, I play football, and I thought ICT worked well within todays sort of employers and stuff. (Participant 1)	• Interest in subject led to GCSE subject choice • Subject choice and application to the real-world

The codes were used to search for themes throughout the dataset. This was achieved by transferring each code onto a post it note and arranging them in clusters. Each cluster encapsulated an over-arching theme, as described by the data. We developed a final thematic map (see Figure 1.) by reviewing and refining the themes. The final stage of refinement involved creating a narrative from the original data extracts to present for analysis.

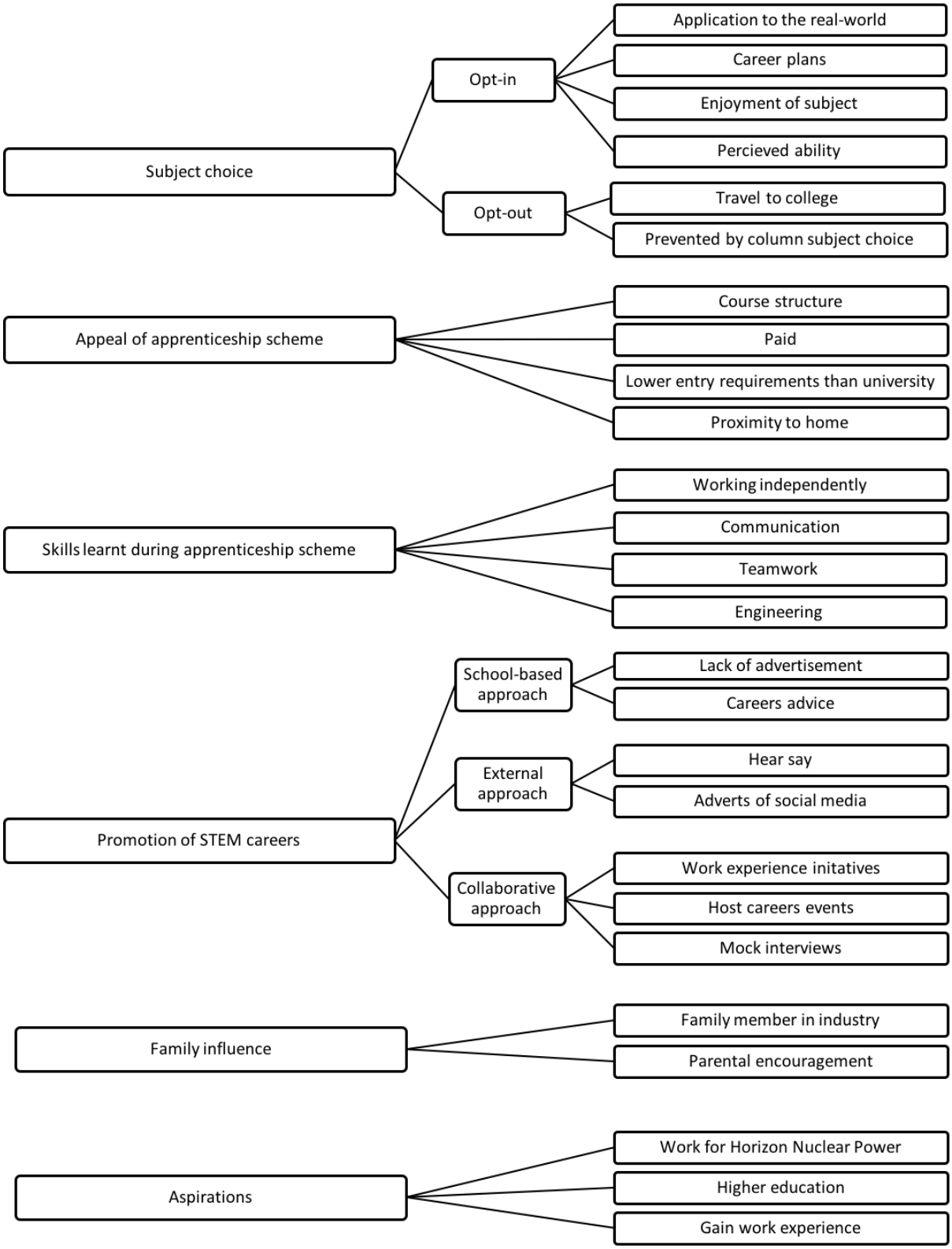

Figure 1. Thematic map derived from interviews with students enrolled on the Horizon Nuclear Power apprenticeship scheme

Results

Theme 1: Subject pursuit

All the apprentices had completed GCSEs, with eight continuing to pursue A Levels. Repeatedly, the apprentices reported that they opted for the subjects that they enjoyed, and were deterred from the ones that they did not. Additionally, uptake was influenced by an interest in the topic and their perceived ability in the subject.

> "I chose triple science because I liked it and I was interested in physics and all" (Participant 1)

> "In GCSE, I just didn't know –laughs-. They were the easiest [subjects] . . . And A-Level I knew I wanted to do something along the lines of engineering but didn't know what yet." (Participant 6).

A deterrent associated with the uptake of Level 2 BTEC engineering was the need to travel from a high school venue to a college. Moreover, the uptake of engineering was discussed in relation to the GCSE subject choice process. In some schools, students were instructed to pick their subject choices using a column system (i.e., the students are given a list of subjects, and they are only allowed to pick one subject per column). The apprentices noted that this led to them prioritising the subjects that matched their aspirations and interests.

> "[My high school] offered [engineering] as a part-time in college, so I'd have to travel to the college a few days a week to do it. Yeah, I don't know why. I just- - Yeah it put me off a bit like that." (Participant 4)

> "[My high school offered engineering as an option] as a once a week in this college, but we had to travel, so we wouldn't - - and with our columns either you do the sciences or you do something else. So, it was kind of physics or say chemistry, so I didn't pick it . . . I wouldn't have been able to get onto this course if I didn't do the double science. So, I found it more important than doing engineering" (Participant 3)

When considering the factors that prevented subject continuation, some of the apprentices reflected on earlier failings in their chosen subjects—specifically at A

Level. In some cases, this led to the apprentices dropping out of sixth form and applying for the Horizon Nuclear Power technical apprenticeship scheme.

> "And then I went to sixth form and I redid the first year twice, doing physics, chemistry, and maths. I didn't pass it the first or second time –laughs-. Sixth form wasn't for me." (Participant 3)

> "I did physics, maths, and psychology. Dropped psychology, I was terrible at it." (Participant 5)

Theme 2: Career promotion

There were mixed perspectives relating to the promotion of STEM careers in high school. This highlights a disparity between both schools and individual students. The comments from the interviews fit into three broad categories (1) how schools promote careers internally, (2) how external agents promote careers, and (3) how schools and companies can collaborate to promote careers.

Promotion within school. Some of the apprentices were positive about how their school delivered careers advice and the promotion of different careers. Positive stories revealed successful school-based initiatives such as hosting careers evenings and the delivery of student-specific careers advice. The success of these events was linked to how well the school promoted them (e.g., the distribution of flyers) and how much the students were encouraged, by the school, to engage. Others felt like their high school did not offer these opportunities and there was limited access to careers advice.

> "I'd say the school itself didn't have a lot of like events going on within the school. But, they did like have flyers and posters going around, telling us they were. Like I went to _____ to do a - - they had like an open event, with loads of different companies. They had like leaflets going around for that. But, they didn't have much stuff coming into the school itself to promote it." (Participant 9).

The input of external agents. Often, employees disseminated information about their companies at external careers events. These events were characterised by employees, or company representatives, hosting an information stand. This offered a platform for

conversation and allowed students to ask role-specific questions. In terms of promotion, several of the apprentices had encountered adverts for these events online, been informed by their school, or heard through hearsay (i.e., family and friends).

Family was revealed as an important agent in the promotion of STEM careers. There was a clear relationship between the parental promotion of STEM careers and having a direct family member in an engineering or nuclear industry. Several of the apprentices reported that having a family member in these roles encouraged them to seek and pursue a STEM career.

> "It was at a careers event in _____ and well loads of different employers came to advertise their apprenticeships and that's where I met _____and he gave me a few flyers about it. And then I saw that they put it on their twitter that they were employing." (Participant 1)

> "Well, since a young age I wanted to be an engineer and this is where I wanted to be because my dad worked in the previous Wylfa power station, so I've wanted to follow his footsteps and go into the new one . . .I feel my school was quite like in with [Horizon Nuclear Power] and were quite - - and trying to give it across as a good idea and a good sort of pathway to go down. But then my dad was also trying to push me towards it as well and had seen it in the newspaper. And, just sort of seen it around, it was publicised quite well so." (Participant 4)

Collaborative approach. The apprentices had positive experiences when their school and external companies collaborated to promote careers. Specifically, they noted the benefits of mock interviews and work experience initiatives. These opportunities offered contact between the apprentices and potential employers, such as Horizon Nuclear Power. This type of experience is a seemingly integral part of informing students what options are available to them once they have completed their high school education.

> "Everything is to do with Engineering now really isn't it? And there is always going to be a job somewhere, even if it's not with what I am doing now. There'll be a job somewhere. I guess, when I did my work experience in Wylfa, I guess that kind of made me decide "yeah, this is what I want to do for the rest of my life"." (Participant 9)

Theme 3: Appeal of the apprenticeship scheme

Following the completion of their high school education, to at least GCSE level, the apprentices began to apply for further education opportunities. For a few of them, the appeal of the Horizon Nuclear Power apprenticeship scheme came from the subject grade requirements. This was a salient theme across those who did not meet the entry requirements need for their desired university course and those who did not enjoy sixth form.

> "I wanted to be an Astrophysicist. But then I saw I needed 2 A*s for the uni I wanted to go to so decided that an apprenticeship was probably easier" (Participant 10)

The opportunity to earn a wage whilst studying also added appeal to the apprenticeship scheme. For some, being paid to learn was more appealing than accumulating debt at university. For others, being paid was just an added incentive to study something that they were already interested in. The majority of the apprentices made a comment about the appeal of being paid to study, making this one of the most prevailing themes from the transcripts.

> "It's a lot better being paid to learn and not to pay to learn, so that's a lot nicer – laughs-. I get to stay home, stay on the Island, which is fun. And there are huge opportunities with the actual apprenticeship, so . . . like I said, you're getting paid to learn instead of paying to learn and living with loads of debts" (Participant 10)

One factor that differentiated between the Horizon Nuclear Power Technical apprenticeship scheme and other schemes was the structure of the course. The apprentices enjoyed being able to study a broad range of technical disciplines in the first year of the scheme and then being able to specialise. Additional appeal came from being able to stay living a home and not having to travel far to study.

> "With this one like you can try everything first year, and then second year and third year are more specific. But like the other [schemes] you just go straight into like one side. So, this is why I went into this." (Participant 2)

Theme 4: Skills learnt through the apprenticeship scheme

The apprentices had completed several months on the scheme before being interview for this study. During this time, they could develop certain skills necessary to complete their training. The apprentices reported the ability to work independently as a valuable skill that they had developed through the scheme. They also reported that their ability to work effectively as a team and communicate with others had improved.

> "There is a lot of teamwork involved but there is also a lot of using your own initiative as well, so that's a good contrast. So, communication skills, you learn a lot of communication skills day to day… [The most important skill is] Probably teamwork. Because in the interview they looked at how you performed in a team. They didn't care about if you finished the task or not, it was the skills you used." (Participant 7)

Theme 5: Aspirations

The Wylfa Newydd Project will not be complete by the time these apprentices finish the Horizon Nuclear Power technical apprenticeship scheme. Several of the apprentices aim to fill this time gap with further work experience, before continuing or returning to work for Horizon Nuclear Power. Some of the other apprentices hope to complete a university-level education, in an engineering discipline, after completing the scheme. All the apprentices aspired to follow STEM-focused routes, whether that be through professional or educational endeavours.

> "I still think I want to go to university. You can do a, I think it's a, higher BTEC diploma. So, I think I still want to go a higher education, but I don't really want to go into the industry just yet." (Participant 3)

> "Because they haven't got a site yet they are hoping to send us out on secondments and loads of different partnerships, nuclear power plants, to get plenty of work experience. So, I just want to stay within the company and keep progressing my engineering skills and then hopefully I will just work my way up to sort of a supervisor type engineer." (Participant 1)

Discussion

The governmental apprenticeship reform, in the UK, aims to put employers at the forefront of apprenticeship schemes. One applied example of a company that already employs an apprenticeship scheme is Horizon Nuclear Power. Upon completion of this scheme, apprentices should hold the skills that they need to excel as engineers, in the nuclear industry. This study explored the views and experiences of a cohort of Horizon Nuclear Power apprentices. In doing so, we aimed to capture a snapshot of their experiences with a specific focus on why they chose to pursue a STEM discipline.

Students need to make decisions about what they want to study at two intervals of their high school education; first at GCSE level and then at the age of 16 (Estyn, 2008). These decisions form the foundations for future academic progression and career choice (Taylor, 2014). Munro and Elsom (2000) suggested that subject choices are made before their long-term implications are understood. UK statistics reveal that uptake and attainment in STEM subjects is low, resulting in a skills shortage among STEM professions (Codiroli, 2015). Horizon Nuclear Power (2017a) is a company that will need individuals with a strong STEM skillset, following the construction of a new nuclear power station. For the apprentices enrolled on the current scheme, interest in studying STEM subjects at school was driven by an interest in the topic and earlier attainment. Brown, Brown, and Bibby (2008) also found perceived enjoyment and predicted grades to be indices that predict later participation in STEM. These drivers suggest the implications of promoting STEM education early and inspiring children to engage in STEM.

Attainment in school affects students' post-16 options (Payne, 2016). Many post-16 courses have specific entry requirements, which can be filtered by subject type, level, and grade. For example, to enrol on the Horizon Nuclear Power (2017b) technical apprenticeship scheme students need five GCSEs at grade C or above including maths, English, and double

science. The participants in this study were all successful in reaching these criteria. However, some were less successful in fulfilling the entry requirements of their chosen universities. For this sub-sample, an apprenticeship was an alternative to gain the qualifications that they needed to progress in a career. UCAS (2017c) emphasised that apprenticeships are not necessarily an easier alternative to completing a degree. They explained that an apprentice would be expected to achieve academically, work simultaneously, and adapt to the demands of the workplace. Nevertheless, the current study offers evidence that there are multiple pathways that students can take to reach their desired career.

Schools, family members, and companies play a key role in career promotion and advice. The availability of this advice is an important starting point for students. However, students are less likely to engage with these events if they are not encouraged to do so. This may highlight the importance of employing effective promotion strategies to complement career-focused, or skill-development, events. This study revealed that effective methods for promoting these events might include advertisements on social media and the distribution of information resources (e.g., leaflets) within school. Social networking websites, such as Facebook and LinkedIn, are the most popular websites on the internet; they also appear to be a cost-effective way for professionals to advertise job openings (Nikolaou, 2014). Since its release, Facebook has grown in popularity and the number of teenage users has significantly increased (Koroleva, Brecht, Goebel, & Malinova, 2011). Facebook business (2017) has an audience selection tool, which allows businesses to target relevant people, based on their demographics and interests. Access to this information could be used to offer high school students information about local apprenticeship schemes and events. Furthermore, placement on a frequently used social media platform may encourage students to click on the advert to find out more, when they may not otherwise have actively sought the information.

Dick and Rallis (1991) illustrated how several factors interact to influence a students' choice to pursue a career in a STEM discipline. Since the publication of their model, there have been some changes in the UK education system and economy. Nevertheless, some of the drivers outlined by Dick and Rallis are seen in the current study. This includes: External influence (the attitudes and behaviours of parents, teachers, and friends), past experiences (achievement in school), and career values (interests, abilities, and cost of training). It is possible that the consistency, or resurgence, of these drivers is due to the nature of the theme headings, opposed to their content. Future research could investigate whether there has been an attitudinal shift of students, parents, and teachers towards vocational qualifications. Correlations may exist between realistic future ambitions (i.e., will there be a job in the desired industry after training?) and the rise in university tuition fees.

The results from this study provide insight into the pathway that Horizon Nuclear Power's apprentices took to gain access to the scheme, what appealed to them about the scheme, and their career aspirations. In order to generalise these findings to other STEM apprenticeship schemes the questions will need to be altered to be more encompassing. This research would also need to be carried out across more companies offering STEM-related apprenticeship schemes. It is also worth considering the use of a researcher who has no affiliation to the company themselves; in order to reduce any demand characteristics from the participants. This project was collaboratively funded by KESS II and Horizon Nuclear Power. As such, Horizon Nuclear Power had some input in the study aims and the questions asked. Although the responses appeared sincere during the interview, it is possible that the apprentices responded with a favourable bias towards the company.

This study was conducted with a small sample of apprentices from the Horizon Nuclear Power technical apprenticeship scheme. Whilst the results offer a snapshot of their experiences, it would be beneficial to replicate this study across different companies across

the UK. This would offer a more holistic representation of the decision process made by apprentices, across STEM disciplines. Consistent themes could help to inform employers about how to maximise the promotion and design of their post-16 apprenticeship schemes. Furthermore, replication could inform schools of effective in-house strategies to inspire student engagement and achievement in STEM disciplines.

[Chapter 4] Discussion of thesis

Broad overview

Science, technology, engineering, and maths (STEM) have become increasingly prevalent in society (Welsh Government, 2014). Voogt, Erstad, Dede, and Mishra (2013) suggested that the ability to understand the basic principles of STEM can help individuals function in society. Additionally, STEM disciplines offer the development of skills that employers value, such as problem solving and critical thinking (Becker & Park, 2011). In Wales, students can decide to opt out of studying certain STEM disciplines from GCSE level (Careers Wales, 2017). The number of students studying STEM subjects past the compulsory curriculum has seen a decline over the last few years (ASPIRES, 2013). This thesis aimed to gain further insight into some of the drivers behind subject choice, with a specific focus on STEM subjects. Additionally, this thesis explored some of the factors associated with the appeal of studying at a high school and apprenticeship level. With Horizon Nuclear Power (2017) playing a pivotal role in the development of a new nuclear power station on the Isle of Anglesey, North Wales, we also sought to understand students' knowledge of the work that the company does. It is estimated that the Wylfa Newydd site will host 850 permanent job opportunities, in 2020. Some of these jobs will be open for applications from individuals with appropriate STEM qualifications. Therefore, it is important to understand if current students in the local region are aware of the opportunities offered by Horizon Nuclear Power. It is possible that some of these students may become future recruits for the company.

Chapter analysis

Chapter 2 captures the results from two studies. Using a combination of surveys and focus groups, we aimed to explore student views on STEM subjects, careers, and Horizon Nuclear Power.

Our original aim for study 1 was to collect views from parents, teachers, and students. Despite our best recruitment efforts, the completion rates on the parent (n = 14) and teacher (n = 9) surveys were low. Higher rates of completion on the parent and teacher surveys would have allowed for comparisons between views on factors such as understanding of the Wylfa Newydd project, encouragement in STEM, and awareness of opportunities. However, we did not have enough data to make these comparisons. As a result, we made the decision to focus on the student responses.

We were successful in recruiting four schools to take part in the online survey. Students in Years 7, 9, and 12 completed this survey, offering views from students at different stages of the high school education system. We designed this survey to be quick to administer and thereby to reduce response effort; this may have contributed to the completion rates. The survey was successful in collecting a large quantity of data from participating schools—with 559 students completing the online survey. The detail in our analysis came from being able to show differences between the year groups, schools, and genders. The wide variety of data collected also highlights the advantages of an online survey design.

This survey generated both quantitative and qualitative responses, allowing for the identification of both significant results and recurring themes. Data analysis revealed that some of the scales lacked reliability. Where Cronbach alpha was less than .70, we removed the scale from further analysis. It may have been beneficial to pilot this survey to allow for refinement and redesign. This is something that should be taken into consideration if this study was to be replicated with a larger sample. In saying this, we found several of our scales to be reliable and thereby we could conduct our analysis. Analysis of the quantitative data showed several significant findings. For example, students did not perceive others who do well in STEM as nerdy, and this significantly correlated with self-reported attendance in STEM subjects. In addition to this, we extracted five themes from the qualitative data: (1)

STEM professionals, (2) subject choice, (3) post-16 pathways, (4) local job prospects, and (5) Horizon Nuclear Power. The results of this research add to the current literature on STEM education and careers, and can inform future studies.

Study 2 allowed for further exploration of the factors discussed in Study 1. Using focus groups, we explored the stereotypes that students hold relating to STEM professionals, factors that students believe influence their educational decisions, and student views on Horizon Nuclear Power. A thematic analysis identified five key themes amongst the transcripts: (1) STEM professionals, (2) subject choice, (3) post-16 pathways, (4) local job prospects, and (5) Horizon Nuclear Power.

To enhance the reliability of this study, we aimed to replicated the focus groups in more schools across North Wales. However, due to timetabling constraints, parental consent, and school uptake we were unable to achieve this within the given timeframe. Whilst more data may have offered a more generalizable overview of factors, the results from this study still hold insightful detail. Additionally, this study offers Horizon Nuclear Power with information about how local students feel about the development of Wylfa Newydd and their marketing material. From this information, Horizon Nuclear Power can begin to think about how they might best target their marketing and information delivery approach to target high school students.

The students in these focus groups reflected on their experiences with Horizon Nuclear Power. Specifically, the students commented on their contact with employees and the promotion material. Other companies could also use this information to think about how they can effectively inform high school students about what they can offer. For example, they may want to consider factors such as the value of social media in the dissemination of information, the design of their website, and the value of in-house visits to local schools. The social validity of these factors could be further enhanced by replication of these focus groups.

Chapter 3 aimed to explore factors that might influence students to pursue STEM subjects during high school. Moreover, this chapter investigated some of the reasons why students might take the next step and pursue vocational STEM training, in the form of an apprenticeship. The sample for this study consisted of a cohort of apprentices enrolled on the Horizon Nuclear Power technical apprenticeship scheme. This scheme offers students an opportunity to develop the STEM-specific skills needed to pursue a career in the nuclear industry.

Our analysis revealed five key themes, relating to the driving factors behind the pursuit of STEM subjects and training: (1) subject pursuit; (2) career promotion; (3) appeal of the apprenticeship scheme; (4) skills learnt through the apprenticeship scheme, and (5) aspirations. Each theme provides insight into how and why students may choose to study STEM and ultimately come to the decision to train for a career in the nuclear engineering industry.

All the apprentices interviewed for this study had recently finished their high school education, before enrolling on the scheme. During their high school education, the apprentices contacted STEM career initiatives. They reflected on how employers and schools can collaborate to promote STEM careers to high school students. For example, benefits come from mock interviews and work experience initiatives. Attendance to these events is imperative in receiving the benefits, thus key agents must ensure that they promote these events effectively.

After completing their high school education, the apprentices made the decision to specialise in STEM. We were successful in obtaining consent for all the students enrolled on this scheme to take part in the interview. As a result, we could provide Horizon Nuclear Power with a representative overview of how the apprentices felt about the scheme in its current design. The apprentices reflected on what appealed to them most about the scheme.

These factors include being paid to learn, the structure of the course, and the ability to remain living at home. This theme adds to the existing literature reiterating the advantages of vocational over academic schemes. Previous literature reported that apprenticeships can be beneficial to companies too (e.g., Lewis, 2014). This is because companies often gain the loyalty of their apprentices (Muehlemann & Wolter, 2014). The results from the current study support this contention, and further add to the literature.

Future directions from this research could include interviewing apprentices at the beginning of the scheme, and again once they finish. This will assess if there are any shifts in views and expectations throughout the duration of the scheme. Moreover, a follow-up study could investigate how apprenticeship schemes can help students in their professional development. On a larger scale, this research could advance our understanding of how apprenticeship knowledge can help individuals in their future career.

Links with previous research

The student survey, focus groups, and apprentice interviews were successful in identifying several key results. For example, we were able to gain a greater understanding of the factors that influence STEM participation (e.g., perceived usefulness of subject) and discontinuation (e.g., perceived difficulty); we demonstrated that students still hold stereotypical views around what STEM professionals look like, their personality traits, and what their job entails; we identified some benefits of completing an apprenticeship scheme, which can be used to promote their appeal (e.g., being paid to learn); and we were also able to provide Horizon Nuclear Power with information about how students view their promotion, their website, and the Wylfa Newydd project.

Previous research identified that disengagement in STEM in a multi-faceted issue. Some factors associated with this are teacher quality, perceived lack of future relevance, and perceived difficulty (Brown, Brown, & Bibby, 2008; Smith & Golding, 2015; Welsh

Government, 2012). These factors were also revealed during Study 1, showing consistency in student attitudes. From a pedagogical perspective, Brown et al. (2008) suggested that the main factor causing students to disengage with STEM is the perceived difficulty of the subject. This is a factor that has been cited in an array of previous research (e.g., Tseng, Chang, Lou, & Chen, 2013; Whalen & Shelley, 2010) and also during Study 1 of this thesis. Brown et al. explained that if the difficulty of maths significantly increases between GCSE and A Level, then it may be appropriate to introduce an alternative, easier, qualification to run alongside the A Level course. This highlights the usefulness of exploratory research in the course design and promotion of educational courses.

At a systematic level, our study highlighted the prioritisation process that students may have to go through whilst making their GCSE and A Level choices using the column system. This could have a longer-term impact as the students also revealed that they were then less likely to take a subject at A Level if they had not studied it for GCSE. To the researchers' knowledge, this is the first time this factor has been found in qualitative research investigating STEM participation.

In Study 2, we used focus groups to gain a deeper understand of the stereotypes students hold around STEM professionals. In the DAST tasks, the students drew scientists in caricature/comic form. In the preceding task, they were presented with real-life headshots, highlighting the physical characteristics that they associated with being a scientist, technician, engineer, and mathematician. Previous research using the DAST has revealed that students hold a common view that scientists are middle-age white men, who work in laboratories, wear laboratory coasts, wear glasses, and conduct experiments (Tan, Jocz, & Zhai. 2017). Many of these characteristics were drawn by the students in the current focus group, perhaps providing some insight into the comical stereotypes that students are exposed to. This knowledge was further enhanced by the head-shot task, which highlighted how facets such as

familiarity and accessories (e.g., glasses, formality of clothing) play a role in stereotypes. The focus groups drew attention away from a specific construct, such as perceiving people who do well in STEM as "nerdy", and instead instilled a bottom-up approach to explore stereotypes. Whereas the online survey very explicitly asked about this construct, with the results suggesting that students do not view people who do well in STEM as "nerdy". The results from this research in part support Archer et al's (2014) claim that the term "nerdy" has been over assumed in its prevalence. However, our research did show that students do still hold clear views about what a scientist might look like and associated personality traits (e.g., "whacko", clever, sophisticated). In a wider context, this lends itself to the idea of self-identity and whether student's views of themselves is congruent with their image of a STEM professional. Some further research is needed to access this association.

Another aim of this thesis was to gain insight into the educational experiences of apprentices, which led them to enrol on a STEM apprenticeship scheme—from high school through to enrolment on the scheme. The researchers' knowledge, this is the first qualitative exploration of this pathway in the literature. Study 3 identified five prevalent themes amongst the sample of Horizon Nuclear Power apprenticeship: (1) subject pursuit; (2) career promotion; (3) appeal of the apprenticeship scheme; (4) skills learnt through the apprenticeship scheme; and (5) aspirations. Each of these themes provide valid insight into the pathways the apprentices took from their GCSE/A Level choices, to their enrolment on the apprenticeship scheme, and where the hope their skills will take them after the scheme has finished. One sub-theme that is consistent with previous literature is the idea of company loyalty (Muehlemann & Wolter, 2014). That is, that the apprentices often plan to continue working for the company in the future. Another key advantage of the scheme, from an apprentice perspective is the idea of learning valuable skills whilst not accumulating student

debt. Again, this is a facet defined by the existing literature as a benefit of apprenticeship schemes (Kirby, 2015).

Limitations

This project was collaboratively funded by KESS II and Horizon Nuclear Power. KESS projects aims to align higher level research skills with businesses. Several project meetings were attended by the masters by research student, her academic supervisors, and a representative from Horizon Nuclear Power. As such, the research was designed with influence from the academic needs of the students and the project aims from Horizon Nuclear Power. Sometimes this led to comprises being made around what information was collected from the studies (e.g., themes around stereotypes and understanding student views about the Wylfa Newydd Project). Additionally, some of the questions asked may have had a slight bias towards the positive aspects of Horizon Nuclear Power's work.

Ortlipp (2008) claimed that there is a bias in qualitative research due to the researchers' experiences, opinions, thoughts, and feelings. To counter this, Ortlipp proposed that reflective diaries are an effective way to acknowledge this process and create transparency in the research process. This was not something that was not used during the qualitative analyses in studies 1, 2, and 3. In retrospect, this would have been a useful adaptation to the current research for the researcher to reflect on her own opinions of Horizon Nuclear Power and the process that led up to the data analysis. In turn, we could have provided a transparent report of how these precursor events may have influenced decisions around developing the questions and analysis.

Whilst ever effort was made to collect data from a large sample, some results from this thesis may need to be taken tentatively in regard to generalisability. In study 1, we were only about to recruit four schools in North Wales to complete the student survey. The overall sample size for this research was large ($N = 559$), but are not intended to represent all

students across North Wales. As previously mentioned, the response rates from the teacher and parent survey were too small to analyse. It may have been worthwhile to try other promotion tactics to increase these responses (e.g., adverts on social media or a researcher attending a parent-teacher evening). However, due to the time restraints of this projects, this did not seem like a feasible endeavour. In study 1, we were only able to recruit one school to take part in the focus groups. The results produced some interesting themes and insight into stereotypes, STEM influences, career opportunity, and student views of Horizon Nuclear Power. Further replications of these groups would be needed across North Wales to create a more holistic report to support these themes. Finally, study 3 presented the views and experiences of Horizon Nuclear Power's apprentices but the results may lack generalisability to other STEM-based apprenticeship schemes. Companies may want to replicate these interviews with their employees to gain perspective on their own team.

Due to the complexity of this project and the amount of data to analyse in 1-year, one study did not make the final thesis. We also collected interview data from past and present employees enrolled on Horizon Nuclear Power's graduate scheme ($N = 7$). The decision to exclude this study was made on the basis that the results were the last to be collected and the researcher ran out of time to be able to analyse the transcripts and write up the report. Instead, Horizon Nuclear Power were provided with the anonymised interview transcripts, to interpret as needed.

Conclusions

This thesis added to the repertoire of research investigating STEM subjects and careers. We were successful in identifying reasons why high school students may decide to engage or disengage in STEM subjects after compulsory education. Furthermore, we gained insight into the appeal of a specific STEM apprenticeship scheme.

Horizon Nuclear Power is a company that is becoming increasingly more involved with the promotion of STEM education and training in North Wales. This thesis offers Horizon Nuclear Power valuable information about the promotion of their work, student views about the Wylfa Newydd project, and the experiences of their apprentices. Horizon Nuclear Power can use this information to shape their future services.

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Table of Appendices

Note. All resources were available in English and Welsh.

Appendix A: Recruitment email for survey research

Dear _____

We are collaborating on a project with Dr Carl Hughes, Dr Stacey Hunter and Ms Kaydee Owen (Master's student) form the Collaborative Institute for Education Research, Evidence and Impact, Bangor University. This research aims to explore Science, Technology, Engineering and Maths (STEM) subject choice within secondary education, attitudes towards STEM, and awareness of career opportunities.

The first part of this project involves a short online survey; and we welcome responses from students (Years 7, 9. and 12), teachers, and parents. We will also be running some small focus groups for students—to further explore factors relating to STEM education and careers. I have attached some additional information about this project to this email. There is no financial cost to participating in this project.

If you are interested in participating in this research project, please email _____.

We look forward to hearing from you.

Appendix B: Parental consent form for survey research

Bangor University/Horizon Nuclear Power

Dear Parent/Guardian,

Horizon Nuclear Power are collaborating with Bangor University to explore Science, Technology, Engineering and Maths (STEM) subject choice within secondary education, student perception of STEM subjects, and awareness of career opportunities. As part of this research, we are conducting an online survey to explore topics such as perceptions held about STEM and the awareness of higher-level skill training.

We would like to offer your child the opportunity to take part in an online survey. Please find enclosed an information sheet that gives you some detailed information about the research, why it is being carried out, and what it will involve. If after reading this, you still have any questions or concerns please do not hesitate to contact the researchers involved in the project (contact details below).

We would also like to offer you, as your child's parent/guardian, the option to take part in a modified version of this survey. Should you wish to find out more and/or participate, please visit the following web address:

https://bangor.onlinesurveys.ac.uk/the-impact-of-stem-interventions-parent-survey	English
https://bangor.onlinesurveys.ac.uk/the-impact-of-stem-interventions-parent-survey-cymraeg-2	Cymraeg

Yours sincerely,

Kaydee Owen

Kaydee Owen	Master by Research Student	seu868@bangor.ac.uk	01248 388656
Dr Carl Hughes	Project Supervisor	c.hughes@bangor.ac.uk	01248 388275
Dr Stacey Hunter	Project Supervisor	Stacey.hunter@bangor.ac.uk	01248 388255

Bangor University Ethics Application No: 2016-15861

Title of the study

The impact of STEM interventions on school pupils' subject choices, career ideas, their awareness of Horizon Nuclear Power and future career opportunities available.

Postgraduate researcher working under the supervision of Dr Carl Hughes and Dr Stacey Hunter, School of Psychology, Bangor University

The following student is undertaking this study as part of their Master by Research project:

Kaydee Owen (student's contact email address: seu868@bangor.ac.uk)

Information about the study

Your child is invited to take part in a research study exploring Science, Technology, Engineering, and Maths (STEM) in secondary schools and future career aspirations. Research suggests that one factor that prevents children from choosing to study STEM subjects beyond GCSE is a lack of knowledge of relevant career opportunities that are available to them. As a result, it is anticipated that there will not be enough individuals, in Wales, to fulfil the upcoming STEM job demand.

Your child will be asked to complete the online survey at school. The questions will address a range of topics such as attitudes towards STEM, knowledge of the work conducted by Horizon Nuclear Power, and their awareness of career opportunities.

Why have I been asked to take part?
Several schools in North Wales have been asked to participate in this research. Students, teachers, and parents/guardians are all being asked to participate in the survey. It is hoped that this sample will provide an insight into the attitudes, knowledge, and awareness in relation to STEM in North Wales.

What will happen during the online survey?
Your child will be provided with a link to the online survey once consent from a parent/guardian has been given for them to partake. Before they begin they will be provided with the details of the project and informed that they do not have to answer any questions that they do not wish to. The survey should take no longer than 10 minutes to complete. They will be asked questions about their STEM education, Horizon Nuclear Power, and their awareness of further training options.

Are there any benefits or risks?
There are no anticipated risks associated with this study. However, if you child changes their mind about taking part, or shows any signs of distress during the survey then they will be asked to stop filling it out. If this happens, an appropriate member of staff will intervene to ensure that your child is cared for in the correct manner.

What will happen to my child's data?

All data collected will be confidential, and your child will not be identifiable in any report, thesis, or publication that may arise from this study. The data from this study will be stored securely for five years. If you choose to withdraw from the study, we will dispose of the information collected on your child and not use it in any way.

What if I don't want my child to take part?
It is up to you to decide whether or not you would like your child to participate in this study. There are no consequences to deciding that you do not wish for your child to take part. In addition, you can withdraw your child from the study at any time without giving a reason.

Who do I contact about the study?
If you have any further questions, please contact Kaydee Owen the master student conducting the interviews or Dr Carl Hughes or Dr Stacey Hunter who are supervising the project. Names are contact details are listed below:

Kaydee Owen	Master by Research Student	seu868@bangor.ac.uk	01248 388656
Dr Carl Hughes	Project Supervisor	c.hughes@bangor.ac.uk	01248 388275
Dr Stacey Hunter	Project Supervisor	Stacey.hunter@bangor.ac.uk	01248 388255

Who do I contact with any concerns about this study?
If you have any concerns or complaints about this study, or of the conduct of the individuals conducting this study, then please contact Mr Hefin Francis, School Manager, School of Psychology, Bangor University, Bangor Gwynedd LL57 2AS or e-mail h.francis@bangor.ac.uk

HORIZON NUCLEAR POWER AND STEM CAREERS ONLINE SURVEY CONSENT FORM

Please return this sheet if you <u>would not</u> like your child to take part in the online survey. This will not affect yours or your child's legal right or education.

Please Initial box

I do not wish for my child to take part in this research. ☐

Please sign and return this form to your child's form tutor at your earliest convenience.

Child's Name in block letters:……

Please indicate what school year group your child is in:……

Parent / Guardian Signature:…… Date……

Parent / Guardian Name in block letters:……

If you have any further questions, please contact the supervisor of the project, Dr Carl Hughes (Tel: 01248 383278: email: c.hughes@bangor.ac.uk) or Dr Stacey Hunter (Tel: 01248 388255: email: stacey.hunter@bangor.ac.uk), Brigantia building, Bangor University, Gwynedd, LL57 2DG

If you have any complaints about how this study is conducted please address these to: Mr Hefin Francis, School Manager, School of Psychology, Bangor University, LL57 2DG.
h.francis@bangor.ac.uk

Bangor University Ethics Application No: 2016-15861

Appendix C: Online consent for student survey

Title of the study

The impact of STEM interventions on school pupil's subject choices, career ideas, their awareness of Horizon Nuclear Power and future career opportunities available.

Postgraduate researcher working under the supervision of Dr Carl Hughes and Dr Stacey Hunter, School of Psychology, Bangor University

The following student is undertaking this study as part of their Master by Research project:

Kaydee Owen (student's contact email address: seu868@bangor.ac.uk)

Information about the study

You are invited to take part in a research study exploring Science, Technology, Engineering, and Maths (STEM) in secondary schools and future career aspirations. Research suggests that one factor that prevents children from choosing to study STEM subjects beyond Year 9 is a lack of knowledge of relevant career opportunities that are available to them. As a result, it is anticipated that there will not be enough individuals, in Wales, to fulfil the upcoming STEM job demand.

The questions on this survey will address a range of topics such as attitudes towards STEM, knowledge of the work conducted by Horizon Nuclear Power, and awareness of career opportunities.

Why have I been asked to take part?
Several schools in North Wales have been asked to participate in this research. Students, teachers, and parents/guardians are all being asked to participate in the survey. It is hoped that this sample will provide an insight into the attitudes, knowledge, and awareness in relation to STEM in North Wales.

What will happen during the online survey?
After you provide consent you will be presented with some questions, you do not have to answer any that you do not wish to. The survey itself should not take any longer than 10 minutes. You will be asked questions about your child's STEM education, Horizon Nuclear Power, and your awareness of further training options.

Are there any benefits or risks?
We do not anticipate any risks associated with your participation in this survey. If at any point you do not want to provide an answer to a question, then just leave it blank and proceed to the next one.

What will happen to my data?
All data collected will be confidential, and you will not be identifiable in any report, thesis, or publication that may arise from this study. The data from this study will be stored securely for

five years. If you choose to withdraw from the study, we will dispose of the information collected from you and not use it in any way.

What if I don't want to take part?
It is up to you to decide whether or not you would like to participate in this study. There are no consequences to deciding that you do not wish to take part. In addition, you can withdraw from the study at any time without giving a reason.

Who do I contact about the study?
If you have any further questions, please contact Kaydee Owen the master student conducting the interviews or Dr Carl Hughes or Dr Stacey Hunter who are supervising the project. Names are contact details are listed below:

Kaydee Owen	Master by Research Student	seu868@bangor.ac.uk	01248 388656
Dr Carl Hughes	Project Supervisor	c.hughes@bangor.ac.uk	01248 388275
Dr Stacey Hunter	Project Supervisor	Stacey.hunter@bangor.ac.uk	01248 388255

Who do I contact with any concerns about this study?
If you have any concerns or complaints about this study, or of the conduct of the individuals conducting this study, then please contact Mr Hefin Francis, School Manager, School of Psychology, Bangor University, Bangor Gwynedd LL57 2AS or e-mail h.francis@bangor.ac.uk

HORIZON AND STEM CAREERS ONLINE SURVEY CONSENT FORM

Please tick the respective boxes if you would like to take part in the online survey.

I confirm that I have read and understood the information sheet for the above study. ☐

I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

I understand that my participation is voluntary and that I am free to withdraw from this research at any time without giving any reason, without my legal rights being affected. ☐

Appendix D: Year 7 online survey

Demographics

1. Please type your full name:
2. Gender:
3. Which school do you attend?

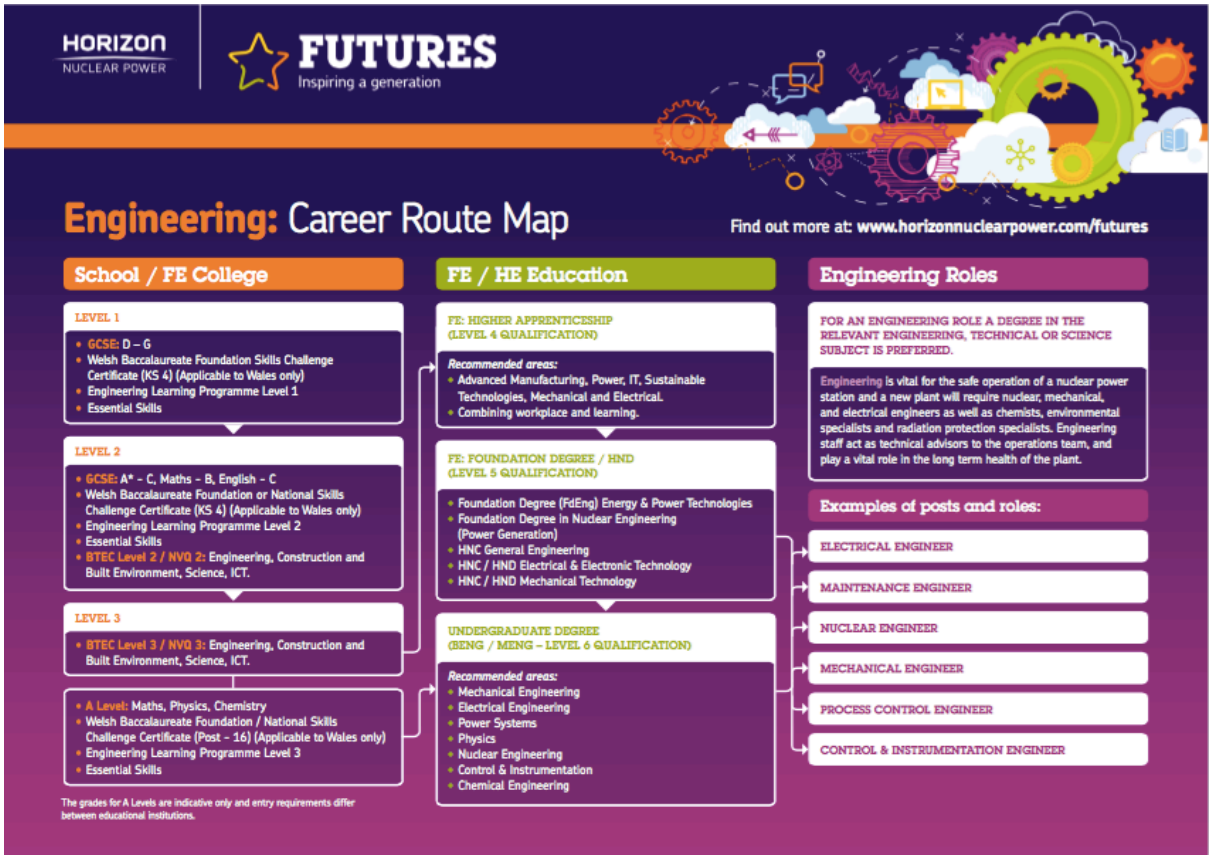
Horizon Nuclear Power

4. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I have a good understanding about the Wylfa Newydd project and Horizon Nuclear Power					
I have a good understanding of the opportunities Wylfa Newydd will offer to young people (through Horizon Nuclear Power)					
I have heard of the Horizon Nuclear Power Technical Apprenticeship Scheme					

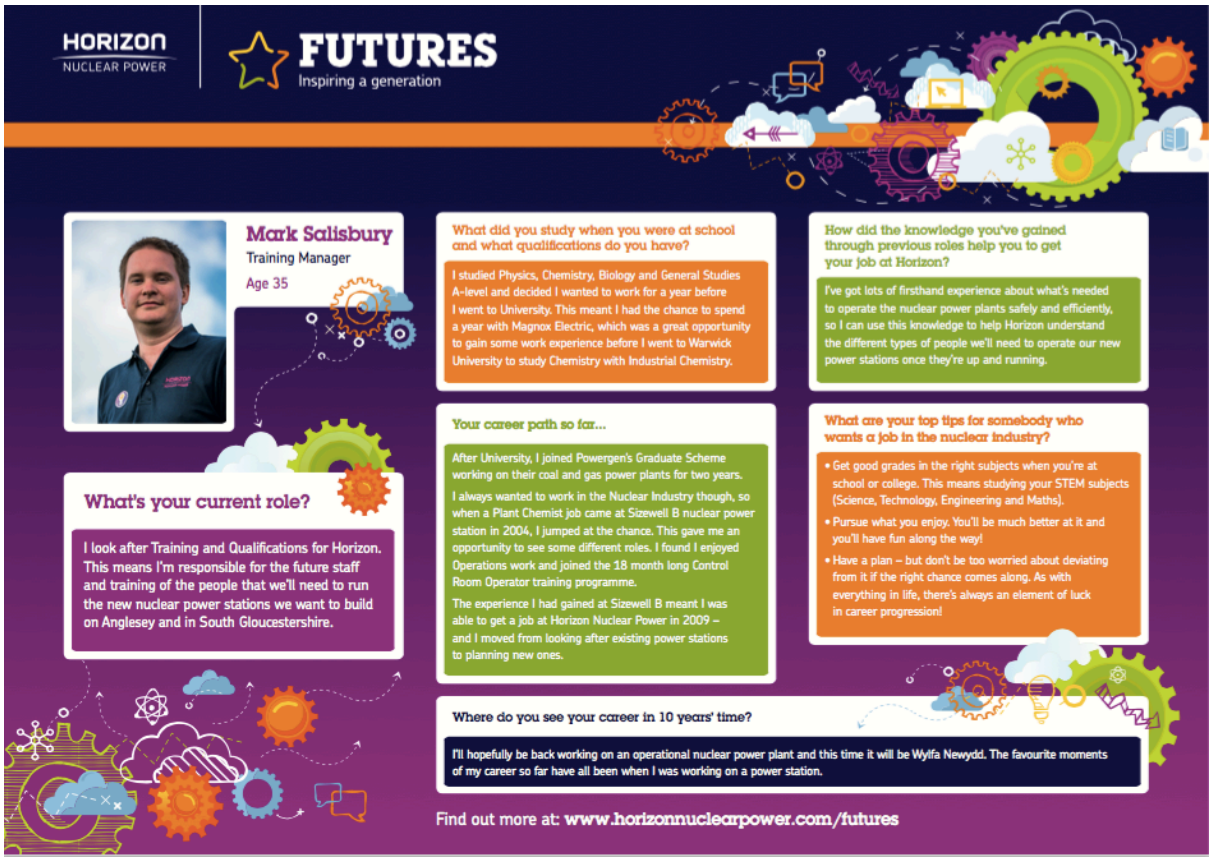
5. In order for a student to be accepted onto the Horizon Nuclear Power Technical Engineering Apprenticeship Scheme, they would need a _____ grade or above in GCSE English, Maths, and Science. [Please fill in the blank from the drop down menu provided]
    a. A
    b. B
    c. C
    d. D
    e. E
    f. F

6.



	Agree	Disagree	I'm not sure
I have seen one of Horizon Nuclear Power's career route maps before			

7.



	Agree	Disagree	I'm not sure
I have seen one of Horizon Nuclear Power's career profiles before			

STEM subjects and careers

8. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
I get good grades in Science						
I get good grades in Technology						

I get good grades in Engineering						
I get good grades in Maths						

9. Please rate your opinion of the following subjects

	1. Really dislike	2	3	4	5. Really enjoy	Not applicable
Science						
Technology						
Engineering						
Maths						

10. Why do you think it is important to do well in STEM (Science, Technology, Engineering, and Maths)?

11. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
My parents think it is important for me to do well in STEM (Science, Technology, Engineering, and Maths)						
My parents encourage me to do well in Science						
My parents encourage me to do well in Technology						
My parents encourage me to do well in Engineering						
My parents encourage me to do well in Maths						

12. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
I think people who do well in Science are nerdy						
I think people who do well in Technology are nerdy						
I think people who do well in Engineering are nerdy						
I think people who do well in Maths are nerdy						

13. Please rate the following statement:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
I know about local apprenticeships that might be available to me when I leave school						

14. Please rate the following statements

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
My school have shown me how STEM subjects (Science, Technology, Engineering, and Maths) apply in the real world						
My parents have shown me how STEM subjects (Science, Technology, Engineering, and Maths) apply in the real world						

15. What job would you like to have when you leave education/training?

Appendix E: Year 9 online survey

Demographics

1. Please type your full name:
2. Gender:
3. Which school do you attend?

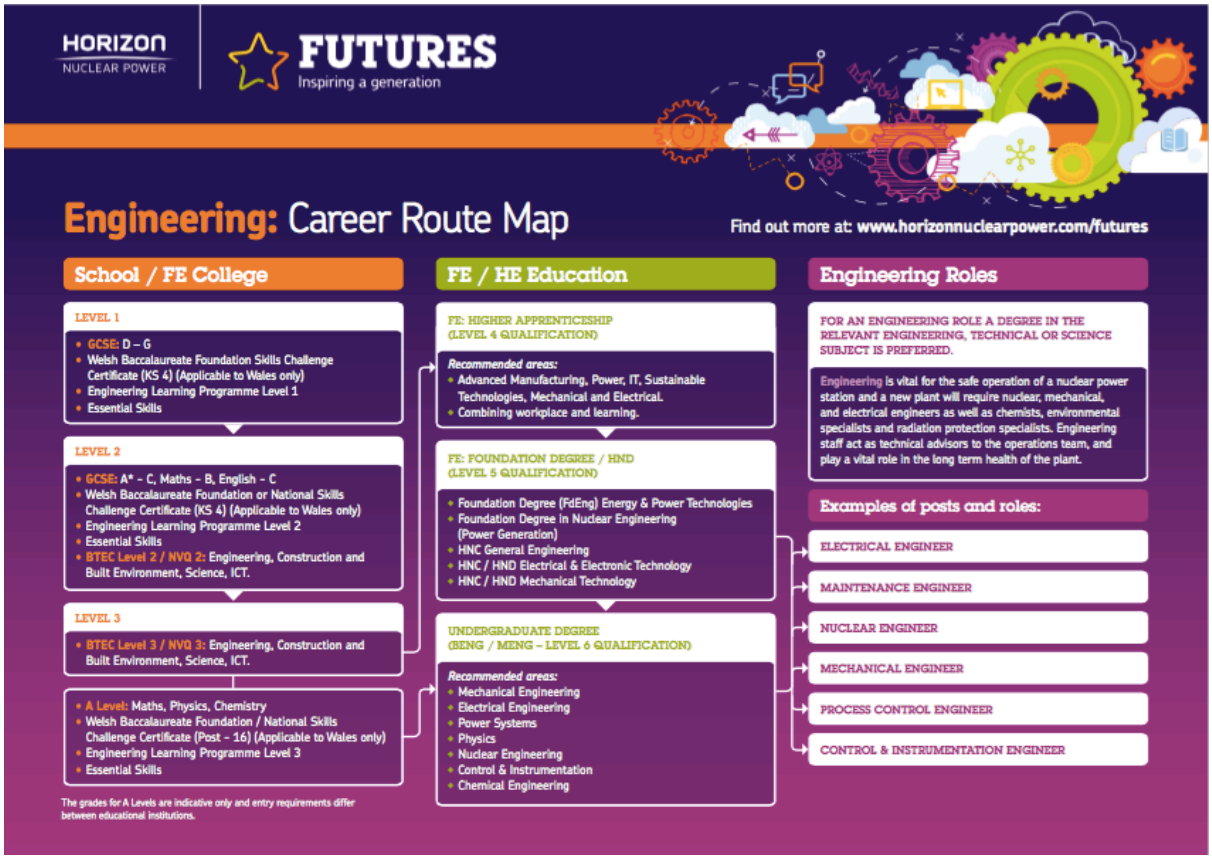
Horizon Nuclear Power

4. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I have a good understanding about the Wylfa Newydd project and Horizon Nuclear Power					
I have a good understanding of the opportunities Wylfa Newydd will offer to young people (through Horizon Nuclear Power)					
I have heard of the Horizon Nuclear Power Technical Apprenticeship Scheme					

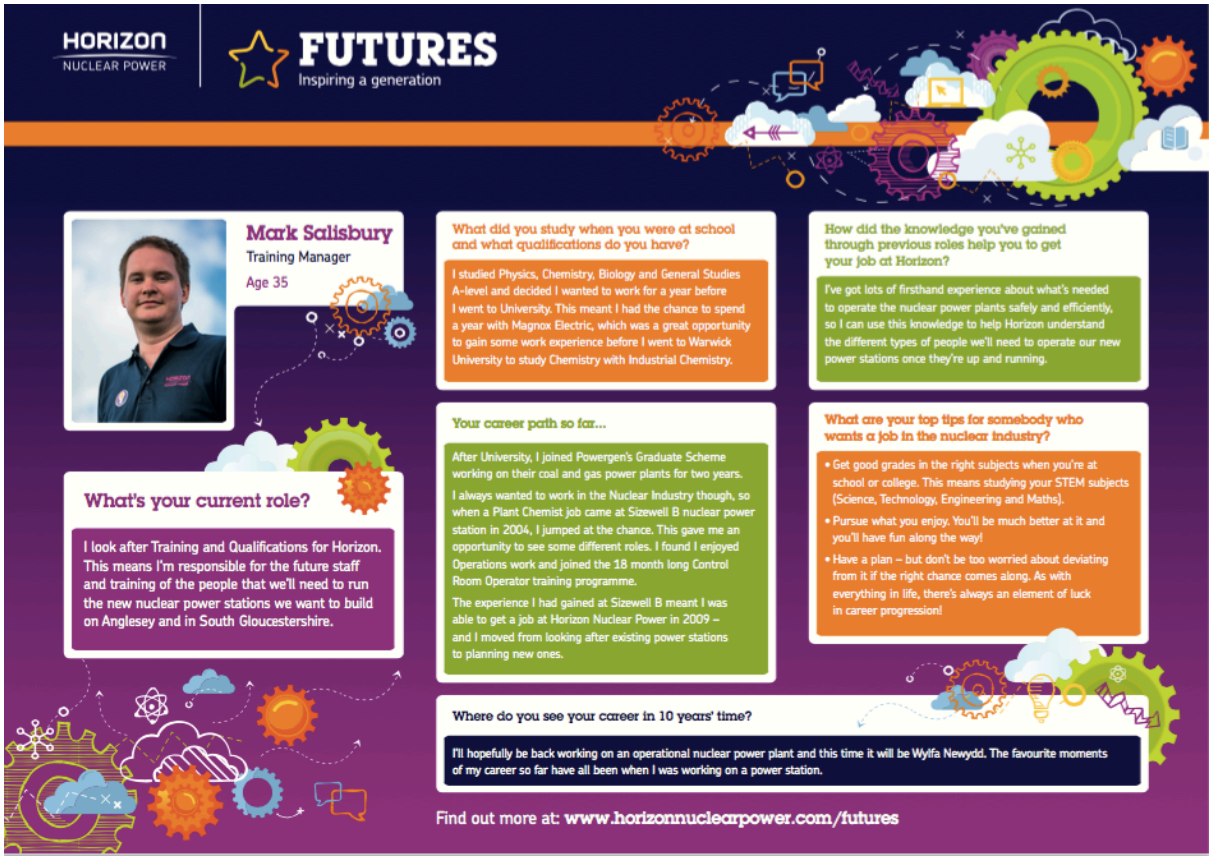
5. In order for a student to be accepted onto the Horizon Nuclear Power Technical Engineering Apprenticeship Scheme, they would need a _____ grade or above in GCSE English, Maths, and Science. [Please fill in the blank from the drop down menu provided]
    a. A
    b. B
    c. C
    d. D
    e. E
    f. F

6.



	Agree	Disagree	I'm not sure
I have seen one of Horizon Nuclear Power's career route maps before			

7.



	Agree	Disagree	I'm not sure
I have seen one of Horizon Nuclear Power's career profiles before			

STEM subjects and careers

16. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
I get good grades in Science						
I get good grades in Technology						
I get good grades in Engineering						
I get good grades in Maths						

17. Please rate your opinion of the following subjects

	2. Really dislike	2	3	4	5. Really enjoy	Not applicable
Science						
Technology						
Engineering						
Maths						

18. Why do you think it is important to do well in STEM (Science, Technology, Engineering, and Maths)?

19. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
My parents think it is important for me to do well in STEM (Science, Technology, Engineering, and Maths)						
My parents encourage me to do well in Science						
My parents encourage me to do well in Technology						
My parents encourage me to do well in Engineering						
My parents encourage me to do well in Maths						

20. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
I think people who do well in Science are nerdy						
I think people who do well in Technology are nerdy						
I think people who do well in Engineering are nerdy						
I think people who do well in Maths are nerdy						

21. Please rate the following statement:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
I know about local apprenticeships that might be available to me when I leave school						

22. Please rate the following statements

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Not applicable
My school have shown me how STEM subjects (Science, Technology, Engineering, and Maths) apply in the real world						
My parents have shown me how STEM subjects (Science, Technology, Engineering, and Maths) apply in the real world						

23. What job would you like to have when you leave education/training?

GCSE options

24. Please type which additional subjects you chose to take (or thinking of choosing) for GCSE [Please put each subject on a separate line]

25. Why did you decide to choose these subjects?

26. If you decided not to choose Double or Triple science, what put you off or stopped you?

27. If you decided not to choose Technology, what put you off or stopped you?

28. If you decided not to choose Engineering, what put you off or stopped you?

Appendix F: Year 12 online survey

Demographics

1. Please type your full name:
2. Gender:
3. Which school do you attend?

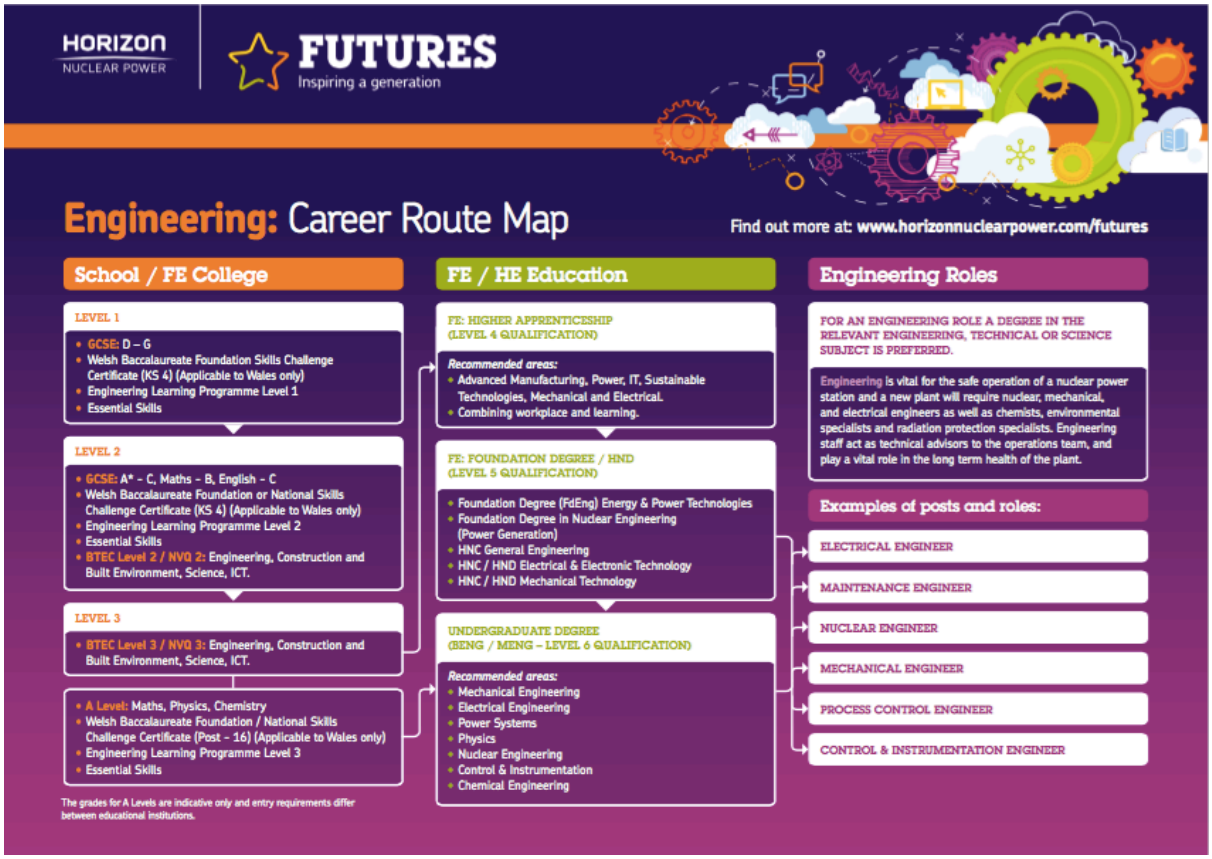
Horizon Nuclear Power

4. Please rate the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
I have a good understanding about the Wylfa Newydd project and Horizon Nuclear Power					
I have a good understanding of the opportunities Wylfa Newydd will offer to young people (through Horizon Nuclear Power)					
I have heard of the Horizon Nuclear Power Technical Apprenticeship Scheme					

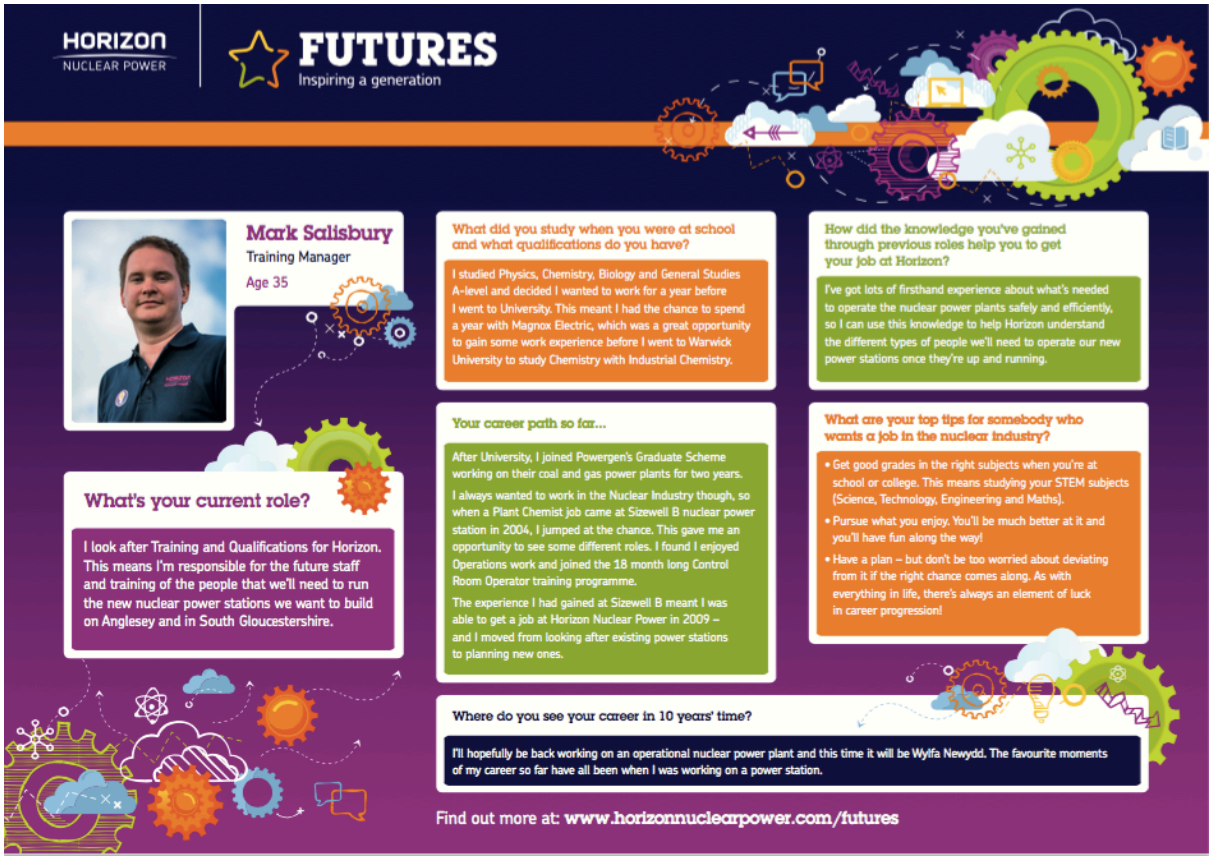
5. In order for a student to be accepted onto the Horizon Nuclear Power Technical Engineering Apprenticeship Scheme, they would need a _____ grade or above in GCSE English, Maths, and Science. [Please fill in the blank from the drop down menu provided]
    a. A
    b. B
    c. C
    d. D
    e. E
    f. F

6.



	Agree	Disagree	I'm not sure
I have seen one of Horizon Nuclear Power's career route maps before			

7.



	Agree	Disagree	I'm not sure
I have seen one of Horizon Nuclear Power's career profiles before			

GCSE options

8. Please type which additional subjects you chose to take (or thinking of choosing) for GCSE [Please put each subject on a separate line]

9. Why did you decide to choose these subjects?

10. If you decided not to choose Double or Triple science, what put you off or stopped you?

11. If you decided not to choose Technology, what put you off or stopped you?

12. If you decided not to choose Engineering, what put you off or stopped you?

A Level options

13. Please type which additional subjects you chose to take for A Level [Please put each subject on a separate line]

14. Why did you take these subjects?

15. If you have taken a Science subject, what appealed to you?

16. If you decided not to take a Science subject, what put you off or stopped you?

17. If you have taken a Technology subject, what appealed to you?

18. If you decided not to take a Technology subject, what put you off or stopped you?

19. If you have taken Engineering, what appealed to you?

20. If you decided not to take Engineering, what put you off or stopped you?

21. If you have taken Maths, what appealed to you?

22. If you decided not to take a Maths, what put you off or stopped you?

Further training

23. Please rate the following statement:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
My school has provided me with enough support to choose which course I want to study at university					

24. If you have decided to go to university, which course have you decided to study?

25. If you have decided not to go to university, what are you hoping to do instead? (Please give as much detail as you can)

26. What job would you like to have once you finish education/training?

Appendix G: Coding for STEM and non-STEM professions

STEM	Non-STEM
Building	Farming
Vet	Youtuber
Maths teacher	Fashion design
Engineer	Police officer
Doctor	Dance
Mechanic	Gym
Paramedic	Hair salon
Pilot	Firefighter
Primary school teacher	Rally driver
Zoologist	Footballer
Graphic design	Business
Engineer lecturer	Cartoonist
Science teacher	History teacher
Air ambulance	Own company
Electrician	Lawyer
Airbus	Photography
Banker	Make-up artist
Nurse	Model
Physiotherapist	McDonalds
Surgeon	Music teacher
Marine Biologist	Traveller
Psychiatrist	Historian
Scientist	Film director
Architecture	Writer
GP	Netballer
Astrophysics	PE teacher
Game design	Cooking
Child nurse	Businessperson
Midwife	Captain of a ship
Royal Navy	Singing teacher
Botanist	Illustrator
Therapist	Work in a sweet shop
R.G hire	Hockey player
Radiographer	Swimmer
Work in Wylfa B	Motorcyclist
Accounting	Solicitor
Archaeologist	Actor
Quantum physicist	Skiing instructor
Forensic psychologist	Baker
Optician	Detective
Airbus	Basketball player
Make videogames	Drama
Environmental science	Sports journalist

Animator	Drama teacher
Royal marines	Child care
Sport science	Art therapy
Dentist	Hairdresser
Orthodontist	Flight attendant
Environmental auditor	Artist
Product design	Social worker
Research science	Show jumping
Counsellor	Musician
Genetic engineering	Truck driver
Medical researcher	Weightlifting
Dental hygienist	Golfer
Adult nurse	Bin woman
Pharmacist	Prime minister
Computer scientist	Sumo wrestler
	Welsh teacher
	Music producer
	Rugby coach
	Victim support
	Journalist
	Counter-terrorism

Appendix H: Coding of STEM and non-STEM subjects

Level	STEM subject	Non-STEM subject
GCSE	3D design	Art
	Additional maths	ASDAN
	Animal care	Business
	Automotive engineering	Catering
	Building environment	Child care
	Coding	Child development
	Construction	Drama
	Design technology (DT)	French
	Food and nutrition	Gym
	Food technology	Hair and beauty
	Geography	Health and social care
	ICT	History
	Motor technical engineering	Hospitality and catering
	Product design	Law
	Resistant materials	Media
	Triple science	Music
	Vehicle technology	Performance and dance
	Woodwork	Physical education (PE)
		Public service
		Religious education (RE/RS)
		Spanish
		Textiles
A Level	Biology	Art
	Chemistry	Business
	Design technology (DT)	Drama
	Further maths	English
	Geography	French
	Information technology (ICT/IT)	German
	Maths	Health and social care
	Mechanical maths	History
	Medical science	Law
	Music technology	Music
	Physics	Photography
	Psychology	Physical education (PE)
	Pure maths	Politics
	Statistics	Public service
		Sociology
		Sports
		Welsh

Appendix I: Focus group topics

Ice breaker: Each draw a scientist and then explain picture to the group

Stereotypes: Provide with a line-up of pictures and ask them to decide as a group which is most likely to be a scientist/mathematician/technician/engineer (explaining their reasons as they go)

Switch off factors:
What factors within school do you think influence the subjects that students choose to study?

External influence:
Who do you think has the greatest influence of the subjects that students choose to study? [prompt: do you think your teachers/parents/the media have any influence? If so, in what way]

Previous experience with Horizon Nuclear Power:
What are your views on the Wylfa Newydd project and Horizon Nuclear Power? [Prompt: what do you think the advantages will be? Disadvantages?]

Discuss experiences of events where Horizon Nuclear Power have been the key employers.

Have a look at the Horizon Nuclear Power website, what would you suggest that it includes?

Note. That this is still under development, but feedback will be useful [prompt: what do you like? What information would you like to know that isn't there?]

Career awareness:
What ways can you develop your skills/knowledge once you leave secondary school?

Discuss knowledge of local job opportunities available, that you are aware of

Exit question:
Is there anything else you'd like to say about STEM subject choices or the work that Horizon Nuclear Power do?

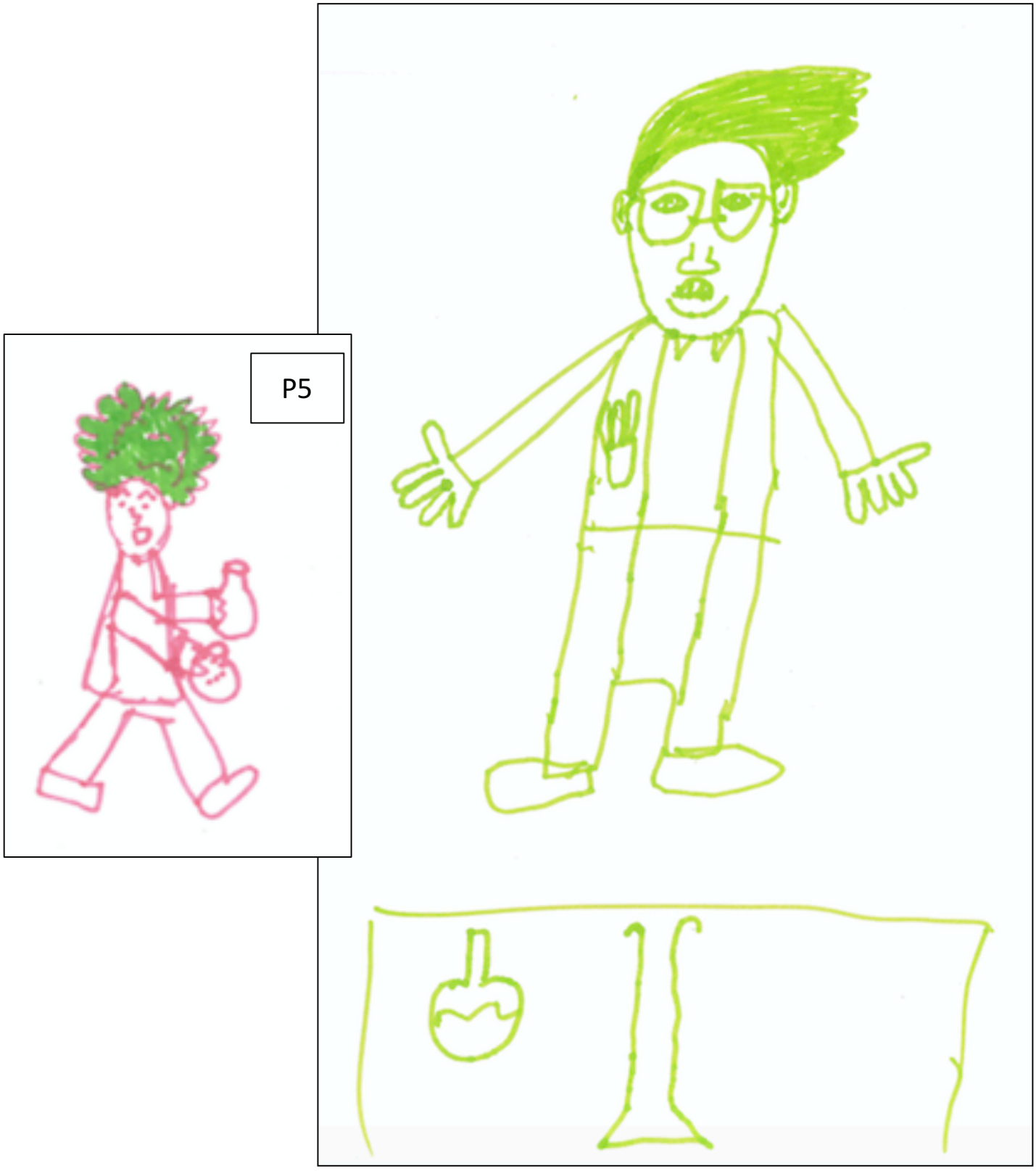
Appendix J: Drawings from draw the focus group task

Note. We have cropped the images to remove student names and blanked out identifying information, as appropriate. Participant numbers are in the top right hand corner of the pictures.

Year 7:


P3


BOB
P4


P5


Mr Sparks
P7


MR
P8

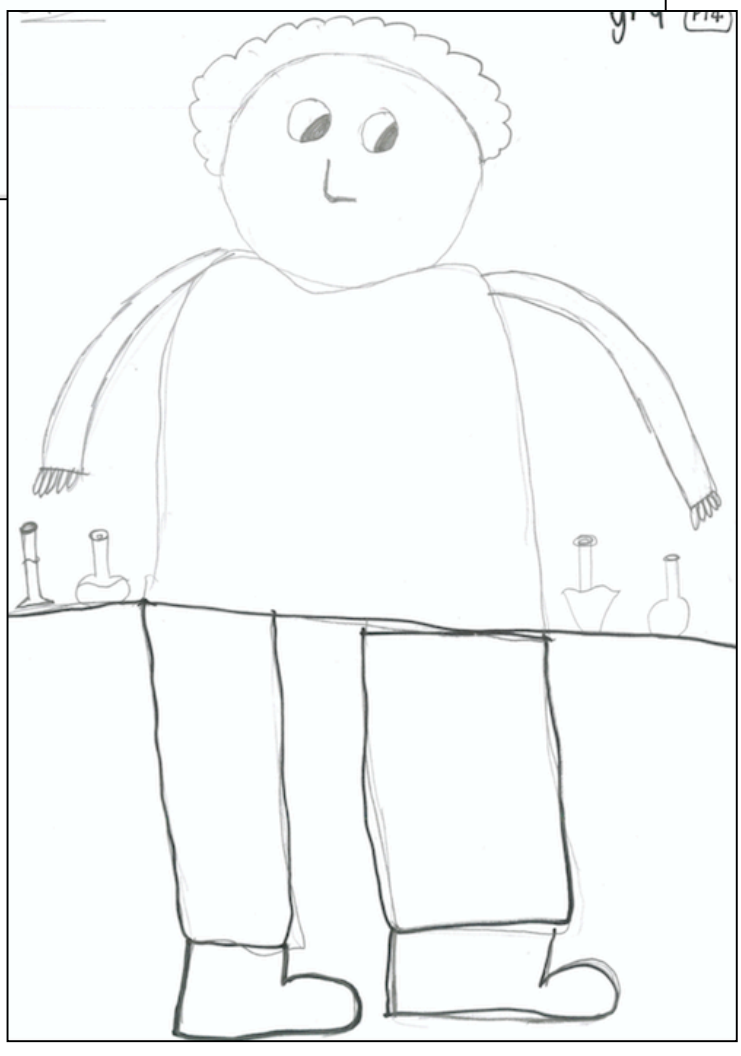
P9

P10

P11

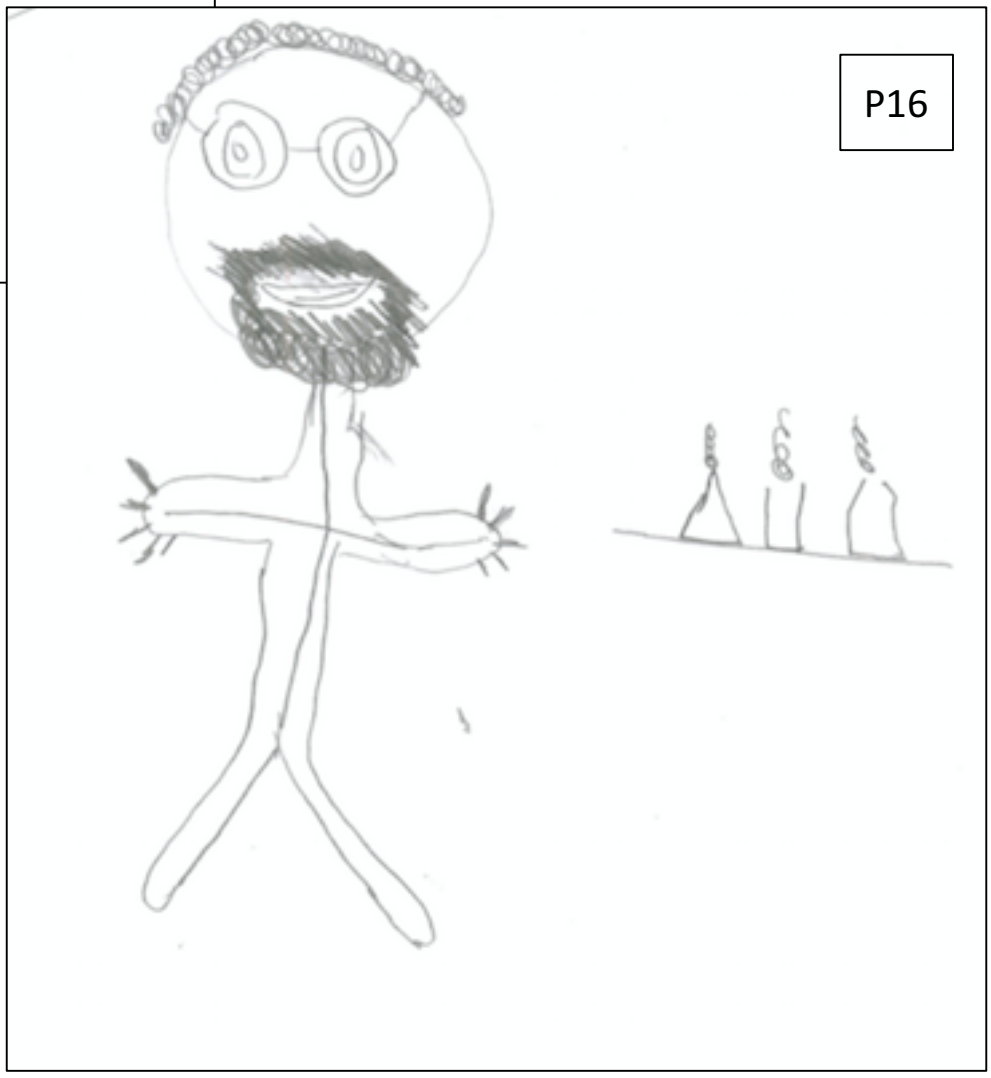
P12

Year 9:

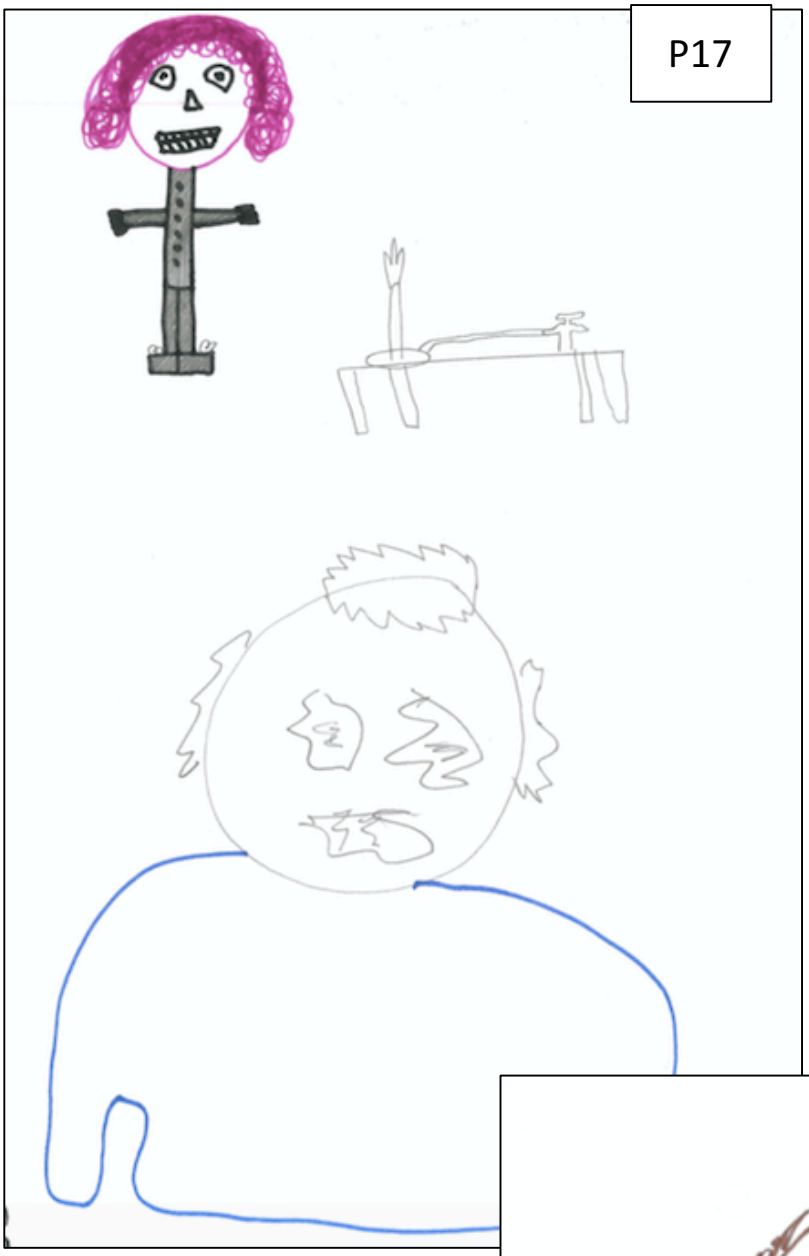


P15

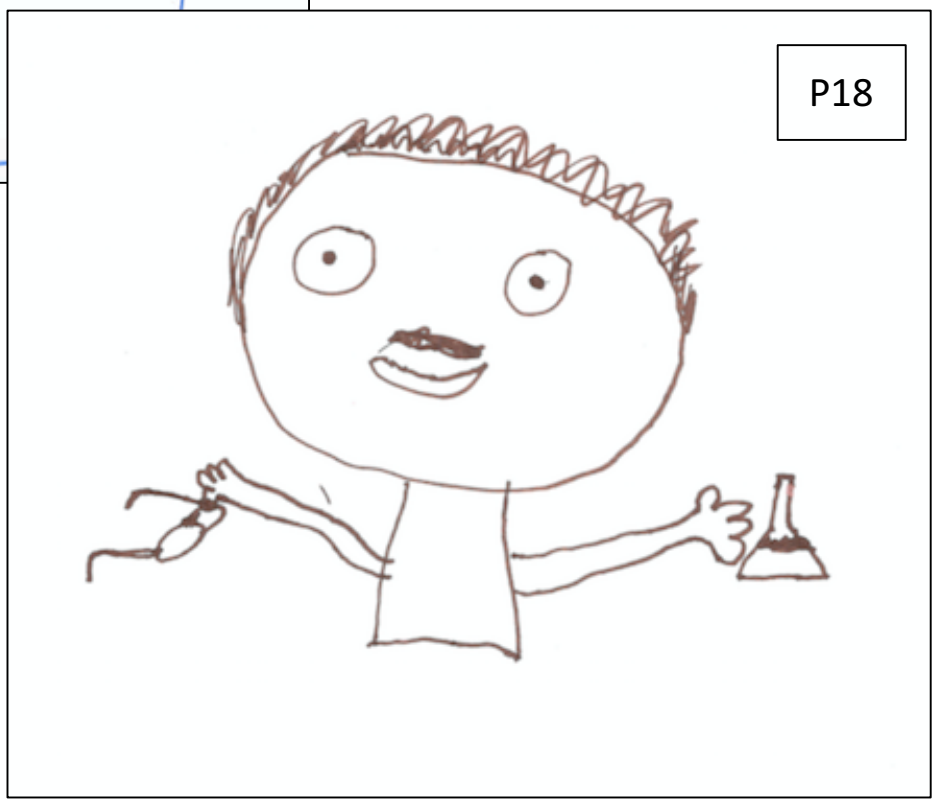
P16



P17

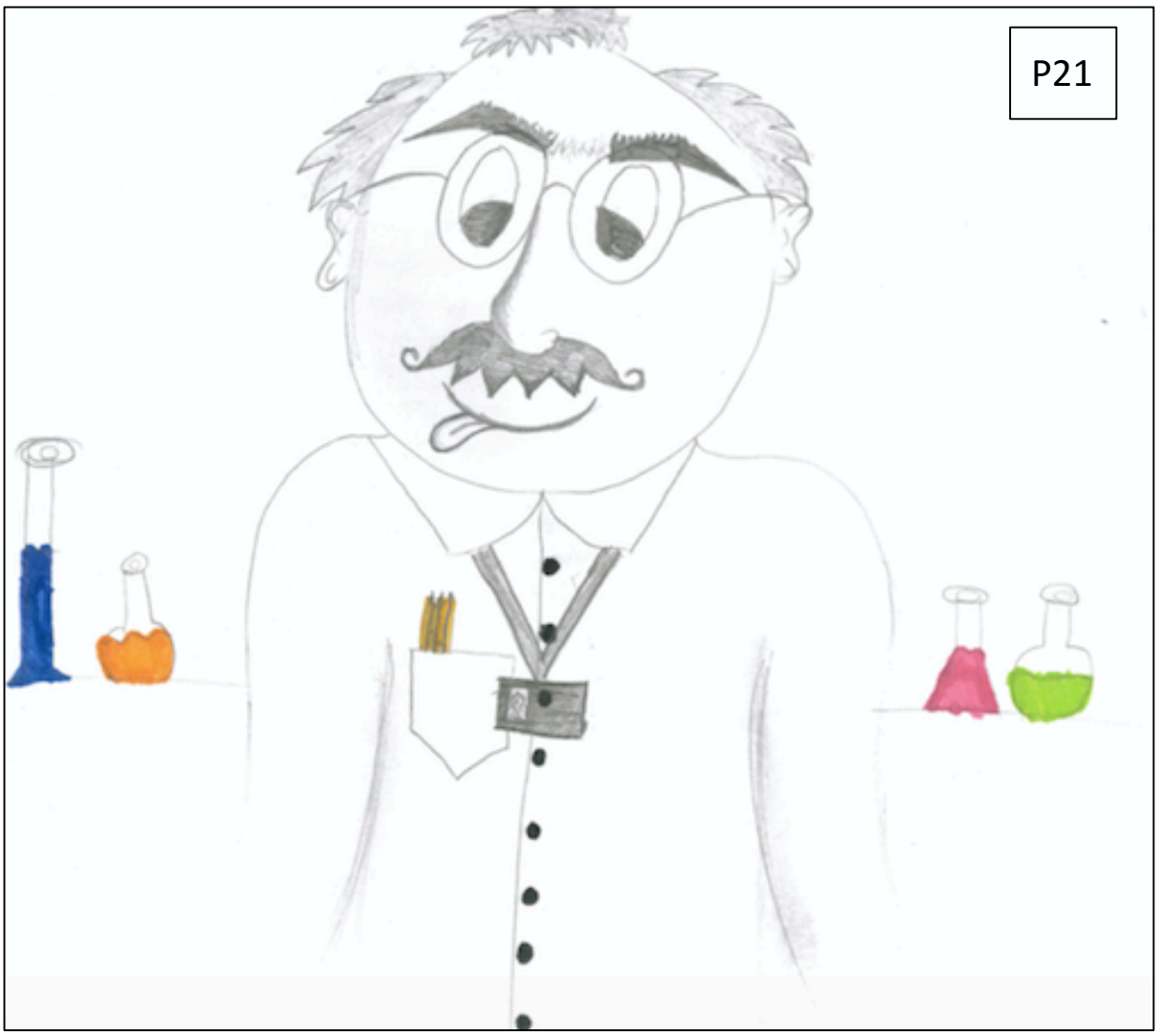


P18




P19


Scientist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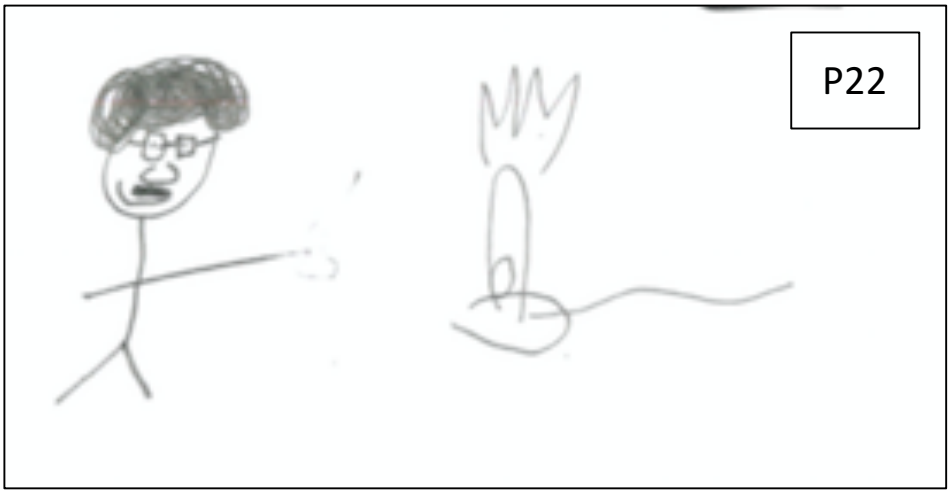
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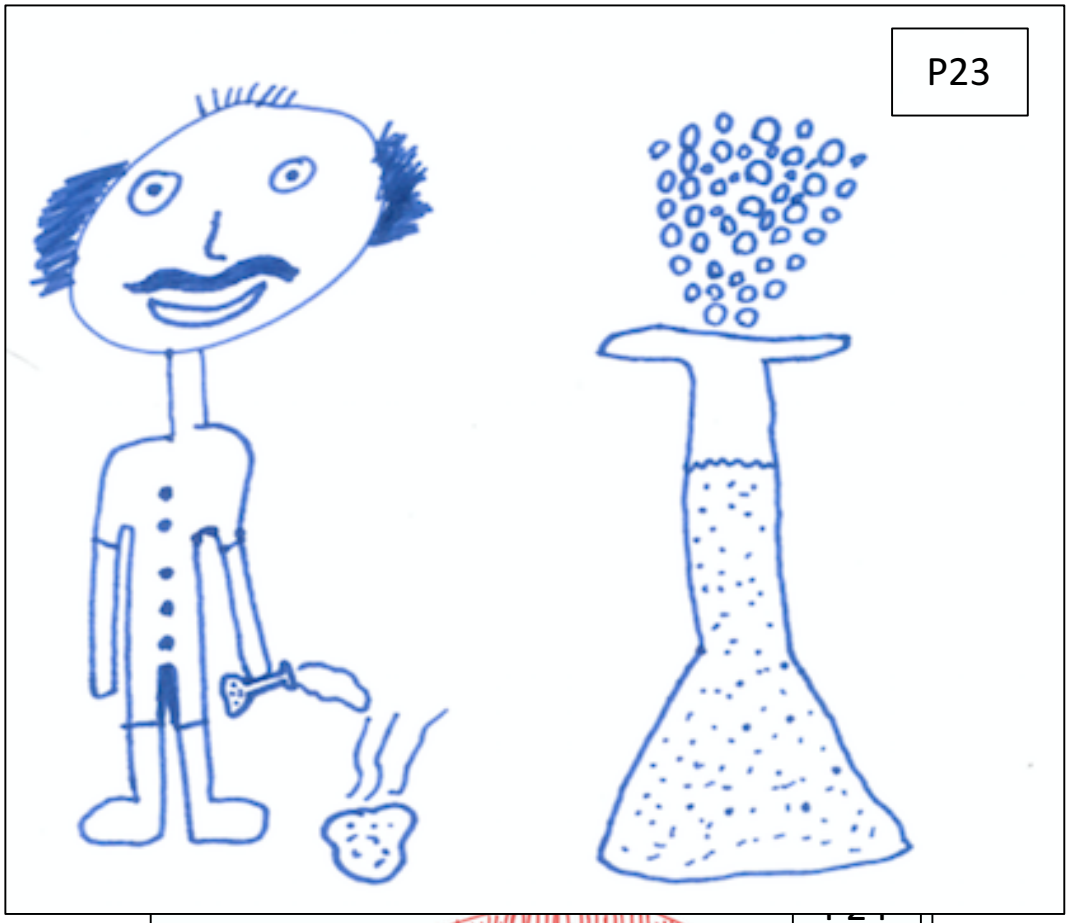
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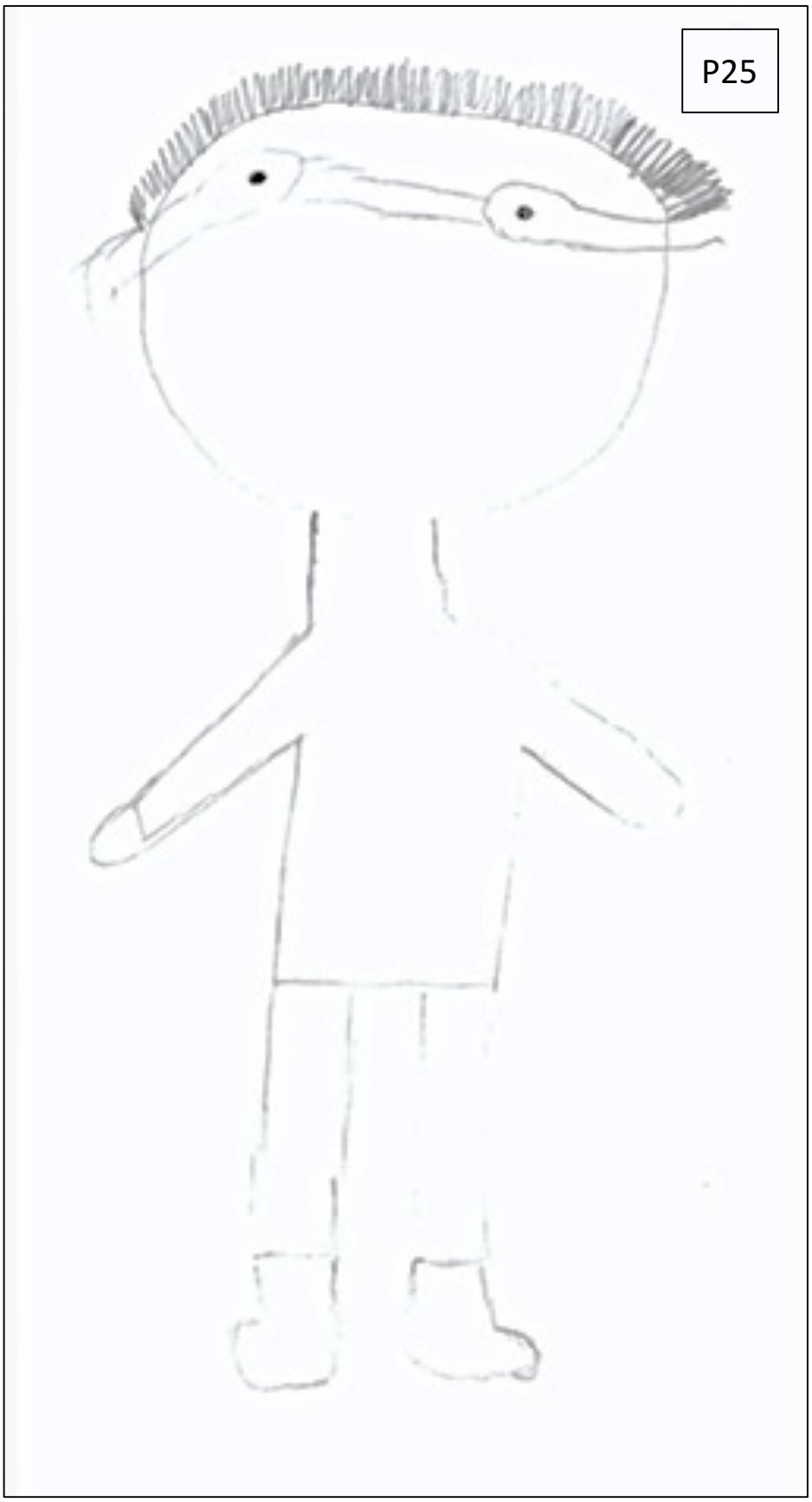

P25

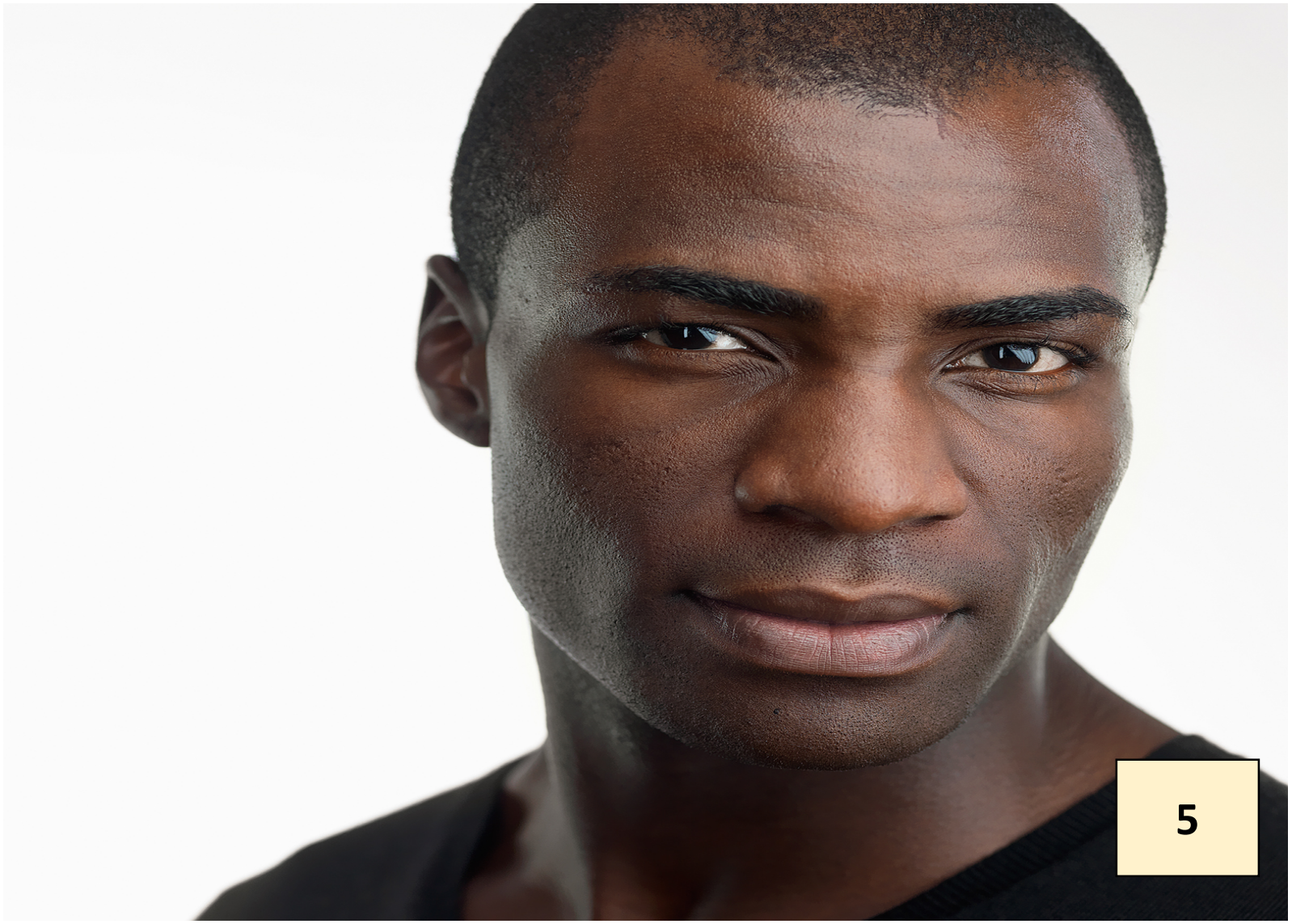
Appendix K: Stereotype task headshots

Retrieved from: http://www.benkrantz.com

Retrieved from: https://digital-photography-school.com/10-tips-for-photographing-great-headshots/

Retrieved from: https://foxmarkers.info/queminfo-mens-acting-headshots.html

Retrieved from: http://www.theheadshotguy.co.uk



Retrieved from: https://peterhurley.com/photography/mens-headshots

Appendix L: Draw the scientist characteristics coding

Year 7	**Feature**	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	
	Male	√	√	√	√	√	√	√	√	√	√	√	√	
	Lab coat		√		√	√	√	√		√		√	√	
	Chemicals/test tubes	√	√	√	√	√	√	√	√		√	√	√	
	Glasses						√							
	Goggles							√		√		√		
	Facial hair		√	√	√		√			√		√		
	Balding head				√					√				
	Pencils in pocket						√							
Year 9	**Feature**	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25
	Male	√	√	√	√	√	√		√	√	√	√	√	√
	Lab coat	√		√		√			√	√		√	√	
	Chemicals/ test tubes	√	√		√	√	√		√	√		√	√	
	Glasses	√		√	√		√			√	√		√	√
	Goggles							√						
	Facial hair	√			√		√			√	√	√	√	
	Balding head	√		√		√			√	√		√		
	Pencils in pocket	√						√		√				
	Bunsen burner										√			

Appendix M: Focus groups transcriptions

Note: Identities have been anonymised to protect the students' confidentiality. FT and KO refer to the researchers.

Year 7:

FT: So, the first task, draw a scientist and then explain the picture.

[Drawing task]

FT: Does everyone want to put their pens down. So, now we are going to try and explain the picture to the group. Whoever is going to speak, remember to say your name. So, say your name and what you want to say. Does anyone want to go first? Does anyone want to explain their picture? Do you want to explain a bit why you drew that? No, that's ok.

Yr 7 (girl): I will

FT: Yeah. Shhh is everybody listening?

Yr7 (girl): My name is _____ this picture is a man putting water into a glass with chemicals in.

FT: Does anyone else want to say anything? That's ok. Yeah, go on then just say your name and explain what you draw.

Yr7 (girl): My name is _____, my picture is about a whacko scientist trying to make a potion out of scientific chemicals that makes him attractive because he's a loner. –laughter-

FT: Just say your name and your answer.

Yr 7 (girl): My name is _____ and I have drawn my favourite teacher, Mr _____, who happens to be a science teacher.

FT: So does everyone want to put their pictures on one pile there then? Do you want to explain your picture?

Yr 7 (boy): Yeah

FT: Go on then, just say your name and say what your picture is.

Yr 7 (boy): My name is _____ and I have drawn a scientist preparing for an experiment.

FT: Want to explain yours?

Ok, everyone ready? Ok, we've got some pictures here. We've got 10 pictures. And I want you to decide as a group which is most likely to be a scientist, which is most likely to be a mathematician, which is most likely to be a technician, and which is most likely to be an engineer. And I want you to explain your reasons, Ok? So ,remember what we did last time? When you go to give an answer hold that and then give your name and your answer. Ok, so do you want to decide as a group who do you think is the most likely to be a scientist, first. Shall we do scientist first?

Yr 7 (boys): No, mathematician.

FT: Ok, do you want to hold that then? Say the number of the card.

Yr 7: (boy) My name is _____ and I think number 4 is the mathematician.

FT: What makes you think that?

Y7 (boy): because, he's got glasses and he looks like a mathematician and he looks like he likes maths.

FT: So, do we all agree? What does everyone else think about number 4 as a mathematician? Does anyone else think any other one is a mathematician?

Y7 (boy): Erm no,

Y7 (girls): She's the scientist

Y7 (boy): He's an engineer

FT: Ok, say your name and your number and explain what you think.

Yr 7 (girl): My name is _____ and I think number 7 is a scientist because she just looks like the typical - - like what a typical scientist would look like. Erm, just, she just looks – laughs- like a typical scientist.

FT: that's ok, thanks.

Yr 7 (girl): I have a feeling he's the engineer but I don't know why.

Yr 7 (girl): My name is _____ and I think number 1 is an engineer because he just looks like he could be engineer and he has an engineer-y type jacket –laughs-.

FT: Thank-you, so, does everyone agree that number 1 is the engineer? Is there anyone else you want to pick as an engineer?

Yr 7 (girl): She might be a mathematician

Yr 7 (boy): or her

FT: What do you think about the technician. Who do we think might be the technician? Who is most likely to be the technician? Does anyone want to give it a go?

Yr 7 (girl): My name is _____ and I think number 2 is a technician because he looks good with computers. I don't know why.

FT: That's ok, thanks. Do we all agree that number 2 - - do we all agree that he looks like the technician?

Yr 7 (boy): My name is _____ and I think number 2 is the engineer because he isn't wearing anything smart. He's wearing more casual clothes than a scientist or mathematician. So yeah, he's probably the engineer.

FT: So does everyone agree with number 2?

Yr 7 (boy): No, he looks like a scientist.

Yr 7 (boy): He looks like an engineer to me.

Yr 7 (boy): That guy looks like an engineer.

Yr 7 (boy): My name is _____and I like number 2 is a scientist because he looks like a scientist and has the kind of style that a scientist would have.

FT: What do you mean by that?

Yr 7 (boy): The clothes, they're not too posh or anything.

FT: So you think number 2 is an engineer?

Yr (7): My name is _____ and I think number 2 is an engineer because he just looks like it.

FT: Ok, so we are going to move onto the next task. So, we are going to do a discussion again as a group, ok? So, I want everyone listening in the middle ok? So, what factors in school do you think influence the subjects that you choose to study? Who wants to go first? What's your name?

Yr 7 (girl): My name is _____ and I think because we can get a better job.

FT: What does everyone else think? What could influence it?

Yr 7 (girl): My name is _____ and I think it could be getting a job and then raise your kids the way you were taught and have them do the same thing over and over again. Yeah.

FT: What does everyone else think? Are there any other factors that you can think of that influence the subjects that you choose to study?

Yr 7 (girl): My name is _____ and I think because I can use them all in different jobs.

FT: Great, does anyone else have anything to say about what factors influence what subjects you choose to study?

Yr 7 (boy): You get a lot of money for your family.

FT: What's your name?

Yr 7 (boy): Do I have to say that one?

FT: Yeah, just say your name. Are you ok with saying your name? or would you rather say your number?

Yr 7 (boy): I'll say my number is _____ and I think its so you can get a lot of money to live better. Thank-you.

FT: Does anybody have anything to add? No?

Yr 7 (boy): My name is _____ and I say certain subjects help you to get enough money to afford a house and a good job.

FT: Can anyone think of any factors in school that might influence you?

Yr 7 (boy): Food.

Yr 7 (girl): My name is _____ and I think factors in school can affect your behaviour because of the way you act and get punished –laughter-

FT: Anyone got anything else to say? No? That's ok. Here is the next question: Who do you think is the greater influence on the subjects that students choose to study? So, do you think your teachers, parents, or the media have an influence, and if they do in what way?

Yr 7 (girl): I don't know how it just does.

Yr 7 (girl): I think - - My name is _____ and I think that the teachers can influence your future because if you like the teacher you're most likely study that lesson - - study that lesson in GCSEs and stuff.

FT: Thank-you. Does anyone else have any other ideas? Do you want to say your number again?

Yr 7 (boy): My number is number 2 and I think that it's the media because people go on their phones a lot and they can search it on google.

Yr 7 (boy): Just google it.
FT: Any other influence of your teachers, parents, or media?

Yr 7 (boy): It can be teachers and parents at the same time.

FT: Say your name and then say why.

Yr 7 (boy): My name is _____ and I think that parents and teachers can influence your future because parents can help at home and teachers can help at school.

FT: Thank-you, thanks. Does anyone else have any ideas? On this side maybe?

Yr 7 (girl): Some people in Cardiff are in charge of the education in schools. My name is _____ and I think the people in Cardiff who are in charge of all the schools in Wales.

FT: Thank-you. Has anyone else got anything they want to say?

Yr 7 (boy): My name is _____ and I think parents will influence you to go to school more and like maybe put you into university or college.

FT: Ok, so we have the next question now: What are your views on the Wylfa Newydd project and Horizon Nuclear Power? Does anyone want to - - Do you have any views on it, do you think there are any advantages to it or disadvantages.

Yr 7 (boy): It's better.

FT: Do you want to explain why?

Yr 7 (girl): It's a disadvantage because if terrorists bomb it then –explosion noise-

Yr 7 (boy): No it's better - -

Yr 7 (girl): and you can have like stuff around it

Yr 7 (boy): I don't think one bomb can take out an entire area.

Yr 7 (boy): I'm number _____ and I think it's better because they will have more security around it.

FT: Can anyone think of any disadvantages. Can you explain the disadvantages?

Yr 7 (boy): I'm number _____ and I think there are disadvantages because if someone bombs it then it could spread across the country and kill people.

Yr 7 (boy): What was the question again?

FT: You want to hear the question again? What are your views on the Wylfa Newydd project and Horizon Nuclear Power. Can you think of any advantages or disadvantages?
Yr 7 (boy): My name is _____ and I think Wylfa Newydd will be more safer and will give more power to like Gwynedd and Anglesey.

FT: Anything else? Or would you like to move onto the next one? So, discuss experiences or events where Horizon Nuclear Power have been the key employers.

Yr 7 (girl): Can you repeat the question please?

FT: Discuss experiences or events where Horizon Nuclear Power have been the key employers. We are going to have a look at the website in the minute as well ok.

[No responses]

FT: What ways can you develop your skills or knowledge once you have finished secondary school? So, if you put your hands up you can say your name and then what you think.

Yr 7 (boy): Do I need to press a button?

FT: No, it's recording now.

Yr 7 (boy): I just need to say my name?

FT: Yes.

Yr 7 (boy): Name is _____. I think you can be affected by - - you can read a lot of books and get lots of knowledge

FT: What does everyone else think? How can you develop your skills or knowledge - - yes?

Yr 7 (girl): My name is _____ and I think you can go to university and study it or something.

Yr 7 (boy): I'm number _____ and I think that you can go to college, and then pass college and then go to university.

FT: Anyone else? How can you develop your skills and knowledge after secondary school?

Yr 7 (boy): My name is _____ and I think if you try and create something it will like encourage you to like make more stuff and like do stuff.

FT: What kind of stuff, do you think?

Yr 7 (boy): Try and get your own company or try and get a job, or make things for that job or something.

FT: Thanks, anyone else got any ideas about how you can develop your skills and knowledge after secondary school?

Yr 7 (boy): I'm number _____ and I think you can study.

FT: Anyone else? No? Does anyone have any knowledge of any local job opportunities that are available?

Yr 7 (girl): Asda –laughs-

FT: Any local job opportunities where you can develop your skills and knowledge? Any job opportunities that you think can help that? That you know of.

Yr 7 (boy): I'm number ____ and I think you can go into a job that you enjoy.

Yr 7 (girl): But there are no jobs around.

Yr 7 (boy): My name's _____ and I think being a policeman can help your physical education thing.

FT: Ok, anything else that you can think of that can help develop your skills or knowledge once you leave secondary school? Anyone heard of anything? A job opportunity that increase their skills or knowledge? Are there any jobs that you have heard of? Anything? There is no right or wrong answer.

Yr 7 (boy): I don't even know where it is but there are people that build rockets.

Yr 7 (boy): NASA?

Yr 7 (boy): Yeah, that's it.

Year 7 (boy): For NASA?

Yr 7 (boy): Yeah. My name is _____ and I think joining a space station would help with science with science and engineering.

Yr 7 (boy): I think joining the army or the navy will help you like know how to fix things and just how to like use things that you wouldn't use in your ordinary life. My name is _____.

Yr 7 (boy): My brothers in the army. He's plays with guns.

Yr 7 (girl): My name is _____ and I think working at the garage because you can fix cars and stuff.

Yr 7 (girl): I think a lawyer. My name is _____ and I think being a lawyer can help with your argumentative skills -laughs- and it will help with maths, I think, when counting what the person has to pay you. Yeah, I don't know. I don't pay the clients, they pay me.
FT: Ok, so are you ready for another question? Is there anything you'd like say about STEM subject choices or the work that Horizon Nuclear Power do?

Yr 7 (girl): My name is _____ and I think their work is helpful for when you want to learn about different things for what they are doing.

FT: What kind of things?

Yr 7 (girl): Like what they are trying to do to help with the Nuclear Power plant.

FT: Does anyone else what to say anything? Would you like me to say the question again?

Yr 7 (boy): Please.

FT: Is there anything you'd like say about STEM subject choices or the work that Horizon Nuclear Power do?

Yr 7 (girl): My name is _____ and I think that STEM is a great opportunity to see what kind of paths you can take in jobs and stuff.

FT: Who else had their hand up then? Did you have your hand up?

Yr 7 (girl): This isn't part of the question but I like how you get into STEM.

FT: Is there anything you would like to add? No, that's ok.

Yr 7 (boy): My name is _____and I think applying for jobs after you have left school, about 3 jobs could get - - if you can get 1 job it'll help and you can get a part-time job as well.

FT: Anything else to say about STEM? Anything else to say about STEM and the work that Horizon Nuclear Power do?

Yr 7 (boy): My name is _____ and I think STEM could help expand your future.

FT: Thank-you. What makes you say that?

Yr 7 (boy): Erm, I don't know. I just think it would help.

FT: That's ok.

Yr 7 (boy): My name is _____ and I think that STEM, the new - - Wylfa Newydd - - I think that Wylfa Newydd will make the planet like run for longer than it might do.

FT: Anyone got anything else to say about STEM subjects? science, technology, engineering, and maths?

FT: Ok, so we are going to go through the website now on the screen, the Horizon Nuclear Power website. And I want a volunteer to scroll through it.

Year 7s (mixed genders): Me.

FT: Ok, let's swap tables with that group.

FT: Ok, so we are going to go back to the question that we were talking about earlier. We were talking about Horizon Nuclear Power. Erm, so, shall we have a look at the website first? Click on that one there. In the middle, at the top. Scroll up a little bit. There you go.

FT: Ok, so can everyone see. Have a look at that for a minute.

FT: So, _____, do you want to guide us through the website?

Year 7 (girl): Ok then. I don't know what to say.

FT: That's ok. So you've got secondary.

Yr 7 (girl): Ok, so the secondary part of the website tells you about the resources to inspire young minds and how to build your skills.

FT: So, what is that talking about? Shall we have a look at the career maps and stuff?

Yr 7 (girl): There are different careers, like engineering, chemistry, health physics, maintenance, business support, and operational careers.

FT: Can everybody see the screen? Scroll down and see what else there is. Click on anything that you'd like to click on.

Yr 7 (girl): I'm going to let them decide.

Yr 7 (boy): Chemistry, wow.

Yr 7(girl): So, this would be the education part of it. So, how you would get . . .

FT: It's ok, you're doing well.

Yr 7 (girl): Is it like how you would get to learn about it? And then what you would be doing your role of chemistry jobs.

FT: Okay, do you want to go back to the website and see what else there is?

Yr 7 (girl): Ok, I'll click on this. Here is what you would like - - when college - - because there is level 1, level 2, level 3, and the A level. And then there is how you would learn and then recommended areas at the bottom of the education part and then there is the kind of roles that you would be doing again. Such as: electrical engineering, or mechanical engineering, or stuff like that.

FT: So, does anyone have anything to suggest that they could improve?

Yr 7 (girl): My name is ____ and I think they could have like computer designing or like hand drawn designs.

FT: Anyone else have any ideas? What do you like about it.

Yr 7 (boy): My name is _____ and I think Horizon gives you a range of things that you would like to do in the future and how to help other people.

FT: Does anyone want to say what they like about the website? Or what you would like to know that isn't there, that isn't on the website?

Yr 7 (boy): How it started.

Yr 7 (boy): My number is number _____ and I think that it is colourful and it shows you how to get the steps into your career.

Yr 7 (boy): Like how it started.

FT: Does anyone have any suggestions?

Yr 7 (girl): My name is _____ and I think that they should include like - - if people succeeded and they enjoyed it then they should put videos of like what people thought about it.

Yr 7 (boy): My name is _____ and I think that Horizon webpage should show how Horizon and STEM started.

FT: Ok, so the website is still being developed. So, is there anything that you can think that they can add. Or something you like that they can develop further?

Yr 7 (boy): My name is _____ and I think the website should show a diagram of how Wylfa Newydd will look like in the future.

FT: Would you like to discuss it as a group and see what you come up with?

Yr 7 (boy): There are also some of Horizon employees talking about their jobs.

FT: shall we open one of these and see what it says?

Yr 7 (boy): Yeah, like emergency words person.

Yr 7 (girl): So, we have Jamie Stevens and he is the emergency preparedness lead for Horizon.

FT: So, this is talking about the roles and stuff. What do you think about that aspect of the website.

Yr 7 (boy): I'm number _____, and I think it's good because it is showing people that are in charge and stuff about them, so you get to know them.

FT: Ok, so before we finish with the website, does anyone else have any ideas or anything else that they would like to say before we move on?

Ok, so let's go back to the last question. Is there anything else you'd like to say about STEM subjects or the work that Horizon Nuclear Power do? After everything we've said today, is there anything you would like to add? No? Thank-you.

Year 9:

KO: Ok, so what I want you to do: I've put some pens in the middle of the table, I want each of you to draw a scientist for me. You've got 5 minutes.

Yr 9 (boy): Draw a scientist?

KO: Draw your own scientist.

Yr 9 (boy): Oh. I'm going to draw a stereotypical cartoon.

Yr 9 (boy): I need purple.

KO: Draw it as big as you like on the paper.

Yr 9 (boy): ooh, as big as we want.

Yr 9 (boy): Is it ok if we aren't very good at art?

Yr 9 (boy): I'm amazing at art.

Yr 9 (boy): Oh no, this has gone wrong.

Yr 9 (boy): Look at his feet, what's that? –laughter-

Yr 9 (boy): Is it ok if we aren't good at art? because I'm not really good.-laughs-

KO: Yeah, that's fine.

Yr 9 (boy): Ok, that's just - - he's got a bigger head on one side. Because, why not?

Yr 9 (boy): Oh god, mine is looking like _____. –laughs-

Yr 9 (boy): You've got to have a fringe. You've got to have like a bowl head as a scientist.

Yr 9 (boy): You've got to have a moustache as well. What shall we have?

Yr 9 (boy): I'm going to give him a smiley face.

Yr 9 (boy): He spends a lot of hours on a computer.

Yr 9 (boy): That looks nothing like a scientist. It looks like someone from the 1990s drama.

Yr 9 (boy): Does it? That was what I was going for.

Yr 9 (boy): Shall I just give him a bit of hair. On the top.

Yr 9 (boy): Look at ____'s. She's amazing at art.

Yr 9 (boy): _____, are you amazing at art?

Yr 9 (boy): Oh wait, I forgot his glasses.

Yr 9 (boy): Mine's the best.

KO: 2 minutes left.

Yr 9 (boy): Wait, is that my dad?

Yr 9 (boy): Now, that's my dad.

Yr 9 (boy): I like your drawing _____.

Yr 9 (girl): Thanks, it's bald for now.

Yr 9 (boy): Yeah, he is bald. You've got to put some hair on him.

KO: Last minute.

Yr 9 (boy): Are these famous people because I don't know who they are?

KO: We will come to that in a minute.

KO: Ok, pencils down. Ok, so now I want to know why you have drawn what you have drawn. Does anyone want to go first?

Yr 9 (boy): My name is _____ and I - - I have done it like this because this is how I picture the - - a scientist in my head is seen as the word scientist pops into my head. And that's about it. I mean obviously I know they don't all look the same, but most of them do, so.

KO: Anyone else? Who wants to go next? You've drawn something a little different from everyone else, do you want to go?

Yr 9 (girl): My name is _____. Not all scientists are male and that's about it really.

KO: So, are there similarities you can spot between yours and say the person sat next to you?

Yr 9 (girl): Am the only one who has drawn a female?

Yr 9 (boy): Oh, most of them have glasses and strange hair and like a sort of bald patch on the top. And from what I can see all of them are male except _____ there and _____, because _____ is a woman anyway. And they all hold a beaker.

KO: OK, so lets just move everything off the table so we have these picture available. Ok, so. I have a line-up of pictures here. I want you to decide as a group who is most likely to be a scientist, who is most likely to be a mathematician, who is most likely to be the technician, and who is most likely to be the engineer. I want you to explain your reasoning as you go along and reach a decision as a group.

Yr 9 (boy): This guy seems to be a very happy guy, so he mustn't be a scientist.

Yr 9 (boy): They are all smiling.

Yr 9 (boy): Oh, are they? Nah, yeah. No, this guy is a mathematician, I think.

KO: Say the number of the picture?

Yr 9 (boy): The number of the picture is 3, and this guy looks like a scientist.

Yr 9 (boy): He looks like a primary school teacher.

KO: Ok, so _____ thinks that number 3 looks like a scientist. What do the rest of you think?

Yr 9 (boy): Yes.

Yr 9 (boy): Yes.

Yr 9 (boy): Yes.

Yr 9 (boy): Yes.

KO: Do you all agree? Does anyone disagree? Does anyone think there is another picture? Is there anyone who disagrees with this being the scientist?

Yr 9 (boy): No.

KO: No? Ok, so which one do we think is the engineer?

Yr 9 (boy): I think number 9 is an engineer because she doesn't look as formal as the other. No, because engineers do like practical work as well.

KO: Does anyone disagree? Or agree?

Yr 9 (boy): Me.

KO: Ok, then pass the microphone to _____.

Yr 9 (boy): I think it's number 5.

KO: Why do you think it is number 5?

Yr 9 (boy): because he looks like an engineer.

KO: In what way? What makes him look like an engineer?

Yr 9 (boy): He's strong.

-laughter-

Yr 9 (boy): You can't see his arms.

Yr 9 (boy): He looks strong. He just looks like one.

KO: Does anyone agree? Does he look like the engineer?

Yr 9 (boys): No.

KO: So, make a decision as a group.

Yr 9 (boy): I think It is number 9.

Yr 9 (boy): I found the scientist. I think. I think number 8 is the scientist because she's got a bit of a ginger look.

KO: Did you not think number 3 was the scientist?

Yr 9 (boy): No, I thought he was the mathematician. Number 8 is the scientist because they say if you are ginger there is more iron in your hair, which makes you smarter. So, I think she's the scientist.

KO: Does anyone agree?

Yr 9 (boy): Does anyone agree with me?

KO: remember, you need to come to a group decision.

Yr 9 (boy): I reckon it's this one.

KO: Ok, pass this to _____.

Yr 9 (boy): I think it's number 4.

Yr 9 (boy): What do you think number 4 is?

Yr 9 (boy): The scientist. I think he's the scientist because he has glasses. Most scientists have glasses.
KO: Ok, do we agree. Do we think that number 4 is the scientist? I've got a few nodding heads over here.

Yr 9 (boy): Who wants to go next, anyone?

KO: Are we agreeing that number 4 is the scientist.

Yr 9 (boy): This one is the engineer. This one is the scientist.

KO: So, which one do we think is the engineer?

Yr 9 (boy): This one.

Yr 9 (boy): That one, that one, that one. Oh yeah, that one.

Yr 9 (boy): Nah, she looks like a mathematician.

KO: Ok, let's do mathematician first then.

Yr 9 (boy): This one looks like the mathematician.

KO: So, why do you think that one looks like a mathematician?

Yr 9 (boy): He just looks sophisticated.

KO: Yeah? Anything else? Ok, so which one are we talking about? Number 10?

Yr 9 (boy): Yeah, 10.

KO: Ok, share with the group. Why do we think number 10 is the mathematician?

Yr 9 (boy): No, number 7.

Yr 9 (girl): _____, shut up. Just because everyone disagreed with you.

KO: Listen to _____, why do you think number 7 is the mathematician?

Yr 9 (boy): Ok, she looks clever.

Yr 9 (girl): No, she looks like a scientist.

Yr 9 (boy): I think she looks pretty.

Yr 9 (boy): How can she look like a scientist, when we have already decided which on is the scientist?

KO: Do we want to change our mind on any of them?
Yr 9 (boys): No!

KO: Ok, so who have we got left? The mathematician and the engineer. So which one is the mathematician?

Yr 9 (boy): Ok let's see who gets the most votes.

Yr 9 (boy): wait wait wait, we've done the mathematician.

Yr 9 (boy): Yeah, yeah number 3.

KO: Ok, so number 3 is the mathematician. Who's this? The scientist?

Yr 9 (boy): The scientist.

KO: So, we have got an engineer and a technician left.

-inaudable-

KO: Shh, take it in turns.

Yr 9 (boy): Ok.

Yr 9 (boy): Do you want to? Ok. I think number 2 is the – my name is James - -er is the engineer because he looks - - the technician even because he looks a lot like the technician we have in this school and he's wearing a little black jacket probably, so that means he is the technician.

KO: Ok, so do we agree? Do we think this the technician?

Group: Yeah.

Yr 9 (boy): He does have a computer at home.

KO: Yeah? That sounded like a pretty unanimous yes. So, the last one is the engineer.

Yr 9 (boy): It has to be him! My name is _____, he looks like an engineer because he just looks like an engineer because he has an engineer-ish look about him.

KO: Justify it to the group.

Yr 9 (boy): Erm, - laughs- I dunno. He has a bit of stubble I guess. He has brown eyes. Erm, quite dark skin tone to be honest – laughs-. Very white teeth. I don't really - - Yeah, he's probably the engineer.

KO: Ok, so do we think number one is the engineer?

Yr 9 (boy): Yes.

Yr 9 (boy): No, number 9 is the engineer.

Yr 9 (boys): Why do you think number 9 is the engineer?

KO: _____, you made a very good point before. Would you like to repeat it to the group?

Yr 9 (girl): Why is everyone picking men?

KO: Why do you think it might be a woman?

Yr 9 (girl): Because not everything is a man. It's sexist if you ask me.

KO: For the record, what's number 1?

Group: Engineer.

KO: Number 1 is our engineer. Number 2 is our -- ?

Yr 9 (boy): Technician.

KO: Technician. Number 3 is our - - ?

Group: Mathmatician.

KO: And number 4 is our scientist. Ok.

Yr 9 (boy): I reckon the one with glasses is the mathematician.

KO: Ok, are we listening? So, the next thing I want you to discuss is: What factors in school do you think influences the subjects that you study? Does anyone want to go first?

Yr 9 (boy): It's _____, it's because the equipment that we have, and also with ICT , information technology, it's good to have some nice computers. In this school we are lucky to have some nice computers in the schools and I guess it's sort of the feeling as well, and the teachers, and also the equipment you have to work with.

KO: Anyone else?

Yr 9 (boy): So, are we just saying why we chose the subjects that we did choose?

KO: Yeah, what factors do you think make the difference?

Yr 9 (boy): Like the science subjects?

KO: Like the subjects you chose in school.

Yr 9 (boy): Oh ok. I guess it's just a matter of practicality, isn't it? It's like if you choose drama, music, and art you aren't really going to want to go for an economics job afterwards. The think is right, it's more about practicality than anything.

KO: Girls? Anything to say?.

KO: When you were picking your GCSE subjects, what made say science appeal to you? What made the difference? Anyone got any answers? Have a think and I can come back to you.

Yr 9 (boy): What was the question again?

KO: What factors in school do you think influences the subjects that you study?

Yr 9 (boy): If I enjoy it. Yeah Yeah.

Yr 9 (boy): My name is _____ again, 'cos yeah. I chose my subjects 'cos I like them and my mum and dad told me to.

-laughter-

Yr 9 (boy): There you go _____. Come on say something.

Yr 9 (girl): My name is _____ and I chose the subjects because 1) I enjoy them, 2) I think they make help me, and that's it.

KO: Does everybody feel the same? Are they the same across all of you?

Group: Yeah.

Yr 9 (boy): I have quite stern opinions when it comes to –laughs- when it comes to what you are choosing at school. Like, if you are choosing something because you think it's fun it's not going to be very beneficial in life. You have to really think about what is going to be helpful, more than than it being fun. I didn't really want to choose geography, but I did because it is more practical then like choosing something that isn't. You know? - - Art - - I wasn't going to say anything, but, art. Anyone else want to say something?

Yr 9 (boy): You're awfully quiet today, _____.

Yr 9 (boy): Hi, I'm _____, and this is my porn shot.

-laughter-

Yr 9 (boy): Hello, my name is _____ - -

Yr 9 (boy): Hi, _____.

Yr 9 (boy): - - I reckon the reason is for you to choose the subjects that you have is effects on what your mum and dad work as. So, if your mum and dad work as an engineer, then you might be interested in being an engineer, or something like that, for example.

Yr 9 (boy): Also, as well, it depends on - - for most people who go for the logic, if you aren't very good at a subject, such as - - yeah art, yeah definitely, then I'm not going to pick art. And if there is something that you like, like engineering, then engineering is a good way to go. But, that is completely different if someone is good at art or singing or something then they wouldn't go into engineering.

KO: Okay, thank-you. Next topic to discuss: Who do you think has the greatest influence of the subjects that students choose to study?

[Missing transcription due to Dictaphone fault]

Yr 9 (boy): Other people who have influenced me, I would say _____. Nah, no. Probably my nain and taid, and my dad's brothers, because they all did engineer and it's so much easier to get a job in engineering now because there are not enough of us in the UK. And also, with the new Wylfa developing there is a lot of jobs coming up with that, which I hope to apply for with Horizon.

KO: Anyone got anything else to say on that topic? No? Okay, well that leads us quite nicely only the next question. What are your views on the Horizon Nuclear Power Project and Horizon Nuclear Power?

- Any one got any views on Horizon Nuclear power and the Wylfa Newydd project?

Yr 9 (boy): I think it is beneficial for erm Anglesey, as an Island. But, at the same time, there are a lot more people from foreign countries coming in to work here and the house prices will inflate by a lot once it has finished because of the amount of people who will come. And, they will all be probably spread around and the population will be a lot more. I can't remember how many they said that they would hire. I can't remember, but it is a lot of people. And I would say more than, I would probably say more than 50% of them come from a foreign country, which isn't bad in my opinion, but I guess that is why they are doing the project - - to get other people from Anglesey to try for it.

Yr 9 (boy): The biggest argument against building Wylfa B is erm, just build some wind turbines. But the thing is, someone did the math, and it would take- - you would have to cover the entire surface area of Anglesey, and part of Gwynedd, with wind turbine to match the amount of power that Wylfa B would make in a day, and that's in a year. The thing is, there is every - - there is almost no con when it comes to building Wylfa B, you've got

almost unending source of energy for the entirety of North Wales. There is not really any argument against it. It's just hippies "It's nuclear power, dude".

KO: Does anyone else have any opinions on the Wylfa project? Positive, negative?
Yr 9 (boy): I'm just stretching.

KO: No opinions at all? No?

Yr 9 (boy): Ooo, can I ask a question?

KO: Sure.

Yr 9 (boy): How much does it cost to build Wylfa B?

KO: I don't know.

Yr 9 (boy): Oh, so your not paying for it?

KO: No, no.

Yr 9 (boy): ohhhh –laughs-

KO: Ok, so, what events have you been at where Horizon Nuclear Power have been their as employeers, promoting their project, or the educational services that they have to offer?

Yr 9 (boy): They eh - - Horizon - - I have been to, what's it called? Yeah, I've been to _____ high school and they have been there, and we have learnt about and had some things from there. Also, parents evening they came around and set up a little booth. Got a lot of free biros there, good ones as well. But, the point is, you had a chat with other people who taking the apprenticeship. It was good to hear their views on the - - and how they enjoy it and stuff. And, what else was I going to say? What was the question again? I kind of forgot.

KO: What events have you been at where Horizon Nuclear Power - -

Yr 9 (boy): Oh, they are also doing a night, tonight. Which I'm not going to unfortunately, because I'm going jumping, but better things to do. But, I know _____ is going tonight, and a couple of other people are going to the - - I don't even know what it is, family night? Yeah, family night, tonight.

KO: Anyone else? Anyone been to any events where Horizon Nuclear Power have been there as well?

No? Okay. So, for the next thing we are going to do I need everyone to scoot over that way. Can you all make your way over there, please?

KO: Ok, so this is Horizon Nuclear Power's webpage and they have been developing their education site. So, this is for people, like you, to find about careers in STEM, what Horizon has to offer, the different routes you have into education, and that type of thing. So, I want you to tell _____ what you want to look at and give your feedback on this page of things you like, things you think can be improved, things that are missing and you want, that kind of thing.

Yr 9 (boy): What does this X button do?

KO: It will close it, so don't click it –laughs-

Yr 9 (boy): Do I click it or not?

KO: No.

Yr 9 (boy): No? Ok.

KO: So, what page do you want to go onto?

Yr 9 (boy): What we want? There is engineering, chemistry, health physics, maintenance.

Yr 9 (boy): Can we have chemistry?

Yr 9 (boy): Chemistry.

Yr 9 (boy): Ok, let's have a hand for engineering?

Yr 9 (boy): Oh, just pick one.

KO: OK, let's just start from the top. There you go. Can we pass this round and we will talk about it as we go along. Ok, so someone describe what they are seeing.

Yr 9 (boy): Ok, my name is _____, the page that they have got for engineering - - it is a career route map. And erm, it tells you like what levels there are and what grades you need to get in certain subjects, to get into the level and stuff.

KO: Is this a useful resource for people to use?

Yr 9 (boy): Yeah, it looks pretty useful.

KO: Do you think it is something that you might potentially use at some point?

Yr 9 (boy): Yeah, yeah. I will probably use it, because it will help me with like what to study.

KO: Ok, so if we go back a page - - In this column here are the same thing, they are career route maps for different careers. Are there any careers that you would like to see on this list that aren't on there?

Year 9 (boy): I'm pretty stuck on engineering, to be honest.

Yr 9 (boy): Would computer science fit in.
Yr 9 (boy): I would like to see something about erm computer science when it comes to the options, so you can choose what you want when it comes to things like chemistry and engineering. Because, like - - computer does kind of fit into the whole STEM thing, and erm, it's not really on the list and I would like to see it there.

KO: Is there anything else that anyone would like to see? No? Ok, we will go to the next lot. Ok, so which one would you like to look at next? You've got: training manager, emergency preparedness lead, senior mechanical engineer, site manager, or site security lead.

Group: Senior mechanical engineer.

KO: Go on then, see what this is. Can someone describe it?

Yr 9 (boy): It is very colourful and looks very helpful as well.

KO: Is this the kind of thing that would catch your eye if you were to see it on the wall in school, or at an event.

Yr 9 (boy): Yeah, kids like bright colours, so this will attract them.

KO: What age do you think this would be aimed at then?

Yr 9 (boy): 7 to 13.

KO: Do you think it would apply to people in Years 9, 10, 11?

Yr 9 (boy): Yeah, possibly.

KO: So, do you think the information on here is something that would be useful to you?

Yr 9 (boy): Yeah. The writing is a bit small.

Yr 9 (boy): I am a mechanical engineer, responsible for reviewing - -

Yr 9 (boy): I think it seems pretty good. I like that there is different colours and that in the top and the background it has the cool design of the different sorts of things, like bolts and stuff in the back. That's pretty cool. And, it's good that they have a background of somebody who actually works, and is a senior engineer, and what they did, and what they do, and what they did to get there. And I think - - I have never looked at this before, and I like it.

KO: Ok, so I'm going to throw this one to the girls, you had quite feelings when it came to the stereotype task, about women being in engineering, and things like that. Do you think something like this is beneficial? Obviously, having a woman who is actually in a role at Horizon Nuclear Power, a STEM role, what are your views on that?

Year 9 (boy): When it comes to the role of gender in STEM jobs, in my opinion it should have nothing to do with gender and everything to do with qualifications. Just because someone is a woman, or maybe just because someone is a man, they don't - - they aren't entitled to employment because they are different to- - because they have a different gender. Of course, if a woman has certain qualifications then she has every right to get that job. Again, it has nothing to do with gender. It should have everything to do with qualifications, and nothing can really change that.

KO: What do we think, do we agree with that?

Group: Yeah.

KO: Ok, so the last thing on this page is about the events that Horizon attend and offer. So you have the Profi programme, which Bangor University lead. And, if you click on this, it will take you to their website. You've got reaching wider- STEM family challenge, and here is some more information about that. And then you have Menter Mon, and this links to their website. So, is there anything you'd like to see that isn't there? - - Ok, so what about the page as a whole then?

Yr 9 (boy): It is quite inviting. The warm colours, like the yellow, purple and the orange colours are quite inviting.

KO: Do you think the social media aspect of it is quite important then?

Yr 9 (boy): I think the fact there is links to Horizon Nuclear Power's social media is good because it allows people to have access to, like the Horizon think through different sources and websites and stuff.

KO: Ok, so this website is still under development, and they are still trying to improve it. So, if there is any feedback you would like to give - -

Yr 9 (boy): Selfies.

Yr 9 (boy): Yeah, I see that you have twitter, YouTube, and Instagram but where is the Facebook at? I mean, you should have a snapchat too, so it sort of appeals to people of our age rather than people in their 30s. I reckon, yeah.

KO: Do you think there is enough information on here? Or too much?

Yr 9 (boy): Erm, I don't know. I mean, it doesn't seem - -

Yr 9 (boy): From where I'm sat right now it kind of looks a bit scarce when it comes to like - - yeah, from this perspective it kind of looks a bit scarce, there are lots of empty spaces. I don't know if it's just me being a pedantic person but erm, yeah. _____, can you put it back up, please? Thank-you. I would like to see more information about what you would need to get a job with STEM or Horizon, if that makes sense. Kind of like, yeah.

Yr 9 (boy): Yeah, _____ here, I think - - I also think that erm it's not - - it's not really, erm - - I don't know how to- - it's not really that appealing to me. If I was - - If I was to go onto this Horizon Nuclear Power, you would have to go to education, then secondary schools just to see this. I think you need a little bit more information about the different things and more - - if we go to the home, like more like the different - - maybe something at the front like the jobs saying the jobs you can get from the ages this to that, and what you can possibly aim to get the qualifications. Rather than at the front - - so that I know that it is there, rather than looking through it, rather than clicking on education, then secondary schools, and then whatever you want to pick to actually get to what you want.

KO: Perfect. Ok, shall we leave the website be and head back to the table? For the next thing, we are going to step away from Horizon and all the stuff that they do, and what I want to know is you knowledge about the ways that you can develop your skills and knowledge once you have left secondary school. So, what are your options once you finish your GCSEs?

Yr 9 (boy): GCSEs and A levels.

KO: Tell me?

Yr 9 (boy): Wait, what was the question? Sorry.

KO: What ways can you develop your skills/knowledge once you leave secondary school?

Yr 9 (boy): Erm, a lot of things with GCSE, you don't have as many erm- - you have sort of - - or college, you sort of have a concentrated route to go. But, with A levels, you will progress at a higher level of standard of work, and you can also reach for the higher jobs, such as the senior engineering manager, or whatever it was. You can sort of aim for stuff like that. With GCSE they also - - I know Horizon does a apprenticeship, which _____'s cousin has got. Anyway, I know that they offer apprenticeships after GCSE level to teach you and then you will work for the nuclear company.

KO: So, apart from GCSEs and A Levels, do you know of any other qualifications that you can take? It's ok if you don't.

Yr 9 (boys): BTEC. BTEC is the - - well, now BTEC isn't really worth as much as a GCSE is. No, a BTEC isn't worth anything close to a GCSE, if I'm correct. Erm so, with the college courses, that they offer, they are all BTEC. Which I don't think is sort of right. I think they should do GCSE level work, for those people who want to progress in that because when picking the Level 2 engineering, or something, it is all BTEC. Which doesn't - - Obviously, you get a qualification, but the BTEC isn't actually worth as much in today's time.

KO: Ok, so what about after A Levels? What are your options then? What can you do?

Yr 9 (boy): Uni.

KO: Just uni?

Yr 9 (boy): You can have uni, apprenticeships, erm you can go - - oh a gap year would be amazing. You could travel New Zealand or Australia, backpacking. You can do all sorts of stuff. I'm not sure if they do apprenticeships with Horizon after A levels, do they? I don't know. But you can learn from there. I would be picking physics, maths, and something else in that range to head for the GCSE level.

KO: Ok, let's give _____ a rest for a minute. What are your plans for when you leave school? What avenues are you wanting to go down?

Yr 9 (boy): Uni.

Yr 9 (boy): Erm, once I leave school I will probably go to university, or something like that to do law and get a degree. And, then I would like to do some more stuff in the subjects that I'm interested in and yeah, get the qualifications and get a better job after everything in school and such.

KO: Ok, so there are 13 of you around this table. Put your hands up if you are planning ot go to university once you finish school.

KO: That's 8 of you. What are the rest of you - - 9 of you. What about the rest of you, what are you planning to do once you finish school?

Yr 9 (boy): Work.

KO: Work? Yeah, anything else?

Yr 9 (boy): Gamble online –laughs-

KO: So the rest of you just want to go into work? You don't?

Yr 9 (boy): Apprenticeship.

KO: What about you?

Yr 9 (boy): Work.

KO: Yeah, ok. So, what do you know about the local job opportunities that will be available to you once you leave school. What are the jobs?

Yr 9 (boy): There is nothing.

Yr 9 (boy): -laughs- there is almost literally nothing on Anglesey for us, I'm out of here when I'm older.

KO: Is that the view of all of you?

Group: Yeah.

Yr 9 (boy): Yeah, if anyone stays here I will feel sad for them.

Yr 9 (boy): If you want to work in like the chippy in _____. Yeah, no there isn't really much when it comes to really good job opportunities in Anglesey.

Yr 9 (boy): Oh yeah there is, you can jump off _____ as well, that's a good one.

-laughter-

Yr 9 (boy): Yeah, when you think about it there really is nothing other than like "do you want to do work in Netto?". But, like there isn't really much else. Unless you're a farmer, and like sheep and stuff.

-Laughter –

KO: Those of you who are planning on staying on the Island, what are you planning on doing? Are you staying?

Yr 9 (boy): I'm going to work with my dad.

KO: Yeah? And what is that doing?

Yr 9 (boy): Plastering, building, yeah.

KO: The rest of you, are you all planning to leave? Yeah. Anyone not? Just a show of hands, I won't make you talk if you don't want to. How many of you are planning to stay on the island? Just the 1. And the rest of you are planning to move away? Yeah, perfect. What about in the next couple of years, do you think that they'll be more jobs available that might be of interest?

Yr 9(boy): Hopefully.

Yr 9(boy): _____, do you want to work as a team?

Yr 9(boy): Yeah, me and _____ could work as a team. Our idol is _____ and _____. So, when we get older we will move away from Anglesey.

Yr 9(boy): Well, we have to.

Yr 9 (boy): We have to, because there is nothing here.

Yr 9(boy): Yeah, there is nothing here. Possibly _____, good night life so I've heard. No, also a lot of druggies. Yeah, that's about it.

KO: What about the jobs with Wylfa? Do you think that those jobs are going to be - -

Yr 9 (boy): When it comes to jobs in Wylfa, their aren't really going to be many people from Anglesey who are going to be employed there, because the Chinese are probably better than us in every single way. –laughs- The truth is, like no one really cares. Like, at the end of the day, school kids just play football and like jump for a mile. – laughs- But the thing is the Chinese are taking our jobs, we need to kick them - - yeah, so.

KO: Does anyone else have anything to say on that matter?

Yr 9 (boy): I have something to say. Obviously, with all of this funding, money is - - I don't know if - - because I know the Chinese have brought it, well obviously - - erm, they have brought the company and they are building it. I don't know if they would want to invest as much in us really 'cus there - - I don't think there is that much money going about to influence us to get jobs. Obviously, there are erm things happening, but I don't think it's as beneficial as it needs to be.

KO: Ok, so the last bit of this is an open floor. Is there anything else you would like to say about STEM subjects or the work that Horizon Nuclear Power do? Has anyone got anything that they haven't had chance to say, or would like to say? No, everyone happy?

Group: Yes.

KO: Perfect.

Appendix N: Apprentice Consent Form

STEM INTERVIEW CONSENT FORM
Bangor University/Horizon Nuclear Power

Dear Parent/Guardian,

Horizon Nuclear Power are collaborating with Bangor University to explore Science, Technology, Engineering and Maths (STEM) subject choice within secondary education, student perception of STEM subjects, and awareness of career opportunities. As part of this research, we are conducting interviews with the current cohort of Horizon Nuclear Power apprentices and graduate students. It is hoped that this can provide some insights into the routes students are taking to pursue higher-level training in STEM.

We would like to offer your child the opportunity to take part in this interview. Please find enclosed an information sheet that gives you some detailed information about the research, why it is being carried out, and what it will involve. If after reading this, you still have any questions or concerns please do not hesitate to contact the researchers involved in the project (contact details below).

Yours sincerely,

Kaydee Owen

Kaydee Owen	Master by Research Student	seu868@bangor.ac.uk	01248 388656
Dr Carl Hughes	Project Supervisor	c.hughes@bangor.ac.uk	01248 388275
Dr Stacey Hunter	Project Supervisor	Stacey.hunter@bangor.ac.uk	01248 388255

Bangor University Ethics Application No: 2016-15861

Title of the study

The impact of STEM interventions on school pupils' subject choices, career ideas, their awareness of Horizon Nuclear Power and future career opportunities available.

Postgraduate researcher working under the supervision of Dr Carl Hughes and Dr Stacey Hunter, School of Psychology, Bangor University

The following student is undertaking this study as part of their Master by Research project:

Kaydee Owen (student's contact email address: seu868@bangor.ac.uk)

Information about the study

Your child is invited to take part in a research study exploring Science, Technology, Engineering, and Maths (STEM) in secondary schools and future career aspirations. Research suggests that one factor that prevents children from choosing to study STEM subjects beyond GCSE is a lack of knowledge of relevant career opportunities that are available to them. As a result, it is anticipated that there will not be enough individuals, in Wales, to fulfil the upcoming STEM job demand.

The interviews will be conducted at Coleg Menai. The interviews aim to explore the routes students are taking to become more skilled in STEM. We hope to establish the education and skills that have made your child eligible for the Horizon Nuclear Power apprenticeship scheme. Your child will also be asked about their future career aspirations.

Why has my child been asked to take part?
All students currently partaking in the Horizon Nuclear Power Technical Apprenticeship Scheme are being invited to take part in this research.

What will happen during the interview?
Your child will be asked about their past educational experience (e.g., what subjects they chose for GCSE/A-level) and what their future plans are following the completion of their apprenticeship.

Are there any benefits or risks?
There are no anticipated risks of this research. However, if your child changes their mind about taking part in the study, or shows any signs of distress during the interview, the session will be terminated. In this case, an appropriate member of staff will be contacted immediately to ensure that your child is cared for in the correct manner.

What will happen to my child's data?
All data collected will be confidential, and your child will not be identifiable in any report, thesis, or publication that may arise from this study. The data from this study will be stored securely for five years. If you choose to withdraw from the study, we will dispose of the information collected on your child and not use it in any way.

What if I do not want my child to take part?
It is up to you to decide whether or not you would like your child to participate in this study. There are no consequences to deciding that you do not wish for your child to take part. In addition, you can withdraw your child from the study at any time without giving a reason.

Who do I contact about the study?
If you have any further questions, please contact Kaydee Owen the master student conducting the interviews or Dr Carl Hughes or Dr Stacey Hunter who are supervising the project. Names are contact details are listed below:

Kaydee Owen	Master by Research Student	seu868@bangor.ac.uk	01248 388656
Dr Carl Hughes	Project Supervisor	c.hughes@bangor.ac.uk	01248 388275
Dr Stacey Hunter	Project Supervisor	Stacey.hunter@bangor.ac.uk	01248 388255

Who do I contact with any concerns about this study?
If you have any concerns or complaints about this study, or of the conduct of the individuals conducting this study, then please contact Mr Hefin Francis, School Manager, School of Psychology, Bangor University, Bangor Gwynedd LL57 2AS or e-mail h.francis@bangor.ac.uk

STEM INTERVIEW CONSENT FORM (TO BE COMPLETED BY A PARENT/GAURDIAN)

Please return this sheet to indicate whether or not you would like your child to take part in the interviews.

	Please Initial box
I confirm that I have read and understood the information sheet for the above study.	
I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
I understand that mine and my son/daughter's participation is voluntary and that I am free to withdraw from this research at any time without giving any reason, without mine or my son/daughters legal rights being affected.	
I would like my child to take part in the interview	

Child's Name in block letters:……

Parent / Guardian Signature:…… Date……

Parent / Guardian Name in block letters:……

Please sign and return this form, at your earliest convenience, to: Kaydee Owen, Brigantia Building, Penrallt Road, Bangor, Gwynedd, LL57 2AS.

If you have any further questions, please contact the supervisor of the project, Dr Carl Hughes (Tel: 01248 383278: email: c.hughes@bangor.ac.uk) or Dr Stacey Hunter (Tel: 01248 388255: email: stacey.hunter@bangor.ac.uk), Brigantia building, Bangor University, Gwynedd, LL57 2DG

If you have any complaints about how this study is conducted please address these to: Mr Hefin Francis, School Manager, School of Psychology, Bangor University, LL57 2DG.
h.francis@bangor.ac.uk

STEM INTERVIEW CONSENT FORM (TO BE COMPLETED BY THE APPRENTICE OF THE HORIZON NUCLEAR POWER TECHNICAL APPRENTICESHIP SCHEME)

Please return this sheet to indicate whether or not you would like to take part in the Interviews.

	Please Initial box
I confirm that I have read and understood the information sheet for the above study.	
I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
I understand that my participation is voluntary and that I am free to withdraw from this research at any time without giving any reason, without mine or my legal rights being affected.	
I would like to take part in the interview	

Name in block letters:……

Signature:…… Date……

Please sign and return this form, at your earliest convenience, to: Kaydee Owen, Brigantia Building, Penrallt Road, Bangor, Gwynedd, LL57 2AS.

If you have any further questions, please contact the supervisor of the project, Dr Carl Hughes (Tel: 01248 383278: email: c.hughes@bangor.ac.uk) or Dr Stacey Hunter (Tel: 01248 388255: email: stacey.hunter@bangor.ac.uk), Brigantia building, Bangor University, Gwynedd, LL57 2DG

If you have any complaints about how this study is conducted please address these to: Mr Hefin Francis, School Manager, School of Psychology, Bangor University, LL57 2DG. h.francis@bangor.ac.uk

Bangor University Ethics Application No: 2016-15861

Appendix O: Full Apprentice Transcriptions

Note. KO and FT are the two researchers. All names and places have been anonymised.

Participant 1

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P1: So, in secondary school I done my GCSEs and then I went to sixth form. In my GCSEs I studied all the basic ones that you have to study: maths, English. Then I done the triple science, D&T, ICT, PE, and Welsh. All the basic ones as well. And then I went on to sixth form to do maths, physics, and business studies as well as the welsh baccalaureate. And that was all in _____ school.

KO: Can you tell me a little bit about why you might have chosen your GCSEs, if you can cast your mind back that far?

P1: I chose triple science because I liked it and I was interested in physics and all. I chose PE because I like sports, I play football, and I thought ICT worked well within todays sort of employers and stuff.

KO: How did you first find out about the position you applied for with Horizon Nuclear Power?

P1: It was at a careers event in _____ and well loads of different employers came to advertise their apprenticeships and that's where I met _____and he gave me a few flyers about it. And then I saw that they put it on their twitter that they were employing.

FT: What appealed to you most about the position?

P1: Probably it was the opportunity that I could do what I wanted to do and stay at home. I didn't have to, you know, travel far for what I wanted to do and it was an absolute opportunity to work on such a big project like a nuclear power station. And it fit perfectly with my subjects I was studying at school, like engineering, so.

KO: How long have you wanted to do this sort of thing?

P1: Since I was about. It was probably since my GCSEs in triple science that I realised that I wanted to be an engineer after studying maths and physics and everything like that. That was probably when I realised that this career would be best suited for me.

KO: Did your school offer engineering?

P1: They offered it as a part time in college, so I'd have to travel to the college a few days a week to do it.

KO: Is that what put you off?

P1: Yeah, I don't know how why. I just. Yeah, it put me off a bit like that.

FT: What skills have you learnt through doing the Horizon Nuclear Power apprenticeship scheme?

P1: I've learnt loads of skills. I've learnt teamwork skills. I've learnt loads of different engineering skills, all about different tools. It's helping me a lot with my confidence. It's mainly teamwork skills though that's what is helping me out with.

KO: Is that what you think is the most important thing that you have learnt?

P1: Probably, the most important is teamwork, yeah.

KO: Ok, what is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P1: Once I have finished the scheme I hopefully want to go out on, do. Because they haven't got a site yet they are hoping to send us out on secondments and loads of different partnerships, nuclear power plants, to get plenty of work experience. So, I just want to stay within the company and keep progressing my engineering skills and then hopefully I will just work my way up to sort of a supervisor type engineer.

KO: Would you recommend this scheme to others?

P1: Definitely, I would recommend it, yeah, it's great.

KO: Why?

P1: Because, you know, you just it's going to college but you're also an employee, so you're not just a student. So, you feel the responsibility and it kind of motivates you to work harder and you also get paid at the end of the day so it's a lot of benefits to it, and the opportunity is fantastic.

FT: Do you think your secondary school did enough to promote careers in STEM?

P1: I feel like they did, but they didn't really advertise it as much. Like they had the opportunities within my secondary school but they didn't really push you to do it as much. But I know recently I have been going back with Horizon to do advertising the company and I have noticed that they are doing it a lot more recently.

KO: Do you think that they could have done more?

P1: I do think they could have like pushed us more into doing it.

KO: What sort of things did they offer?

P1: They offered like little events like there is this thing called Engineering Scheme Wales, where you, throughout the year, you design this project that you have been given from an engineer and like they offered things like that where you go to events and they'd be good things for your CV and stuff like that.

KO: Did you engage with many of them?

P1: Not really, they just, I don't know. They didn't advertise it very well to be honest. They'd be like maybe they'd get out they'd tell us one day in the hall and then a couple weeks later they'd be like "oh yeah nobody applied for it".

Participant 2:

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P2: Yeah, I was in Ysgol _____ and I did, what did I do for my GCSEs? I did. It's hard to remember –laugh-. Music, art, textiles, and I actually went blank. I know I did 4 extra above like Welsh, English, maths. Ah, separate science that was it –laugh-. And then I went. I did a year in college, so I did my AS in maths, music, and D&T and then I decided to do an apprenticeship because I wasn't enjoying college that much.

KO: So, you had quite a lot of non-STEM GCSEs, and A-Levels, so why STEM eventually for --?

P2: I always enjoyed maths, and then I enjoyed science and that, but I've I like rallying and I've always like being around cars, with my dad building cars and all that. So, I've always been into engineering and like problem solving and stuff like that, so I thought this is the track for me really.

KO: Did you do quite well in the STEM subjects? Did it sort of motivate you to carry on?

P2: Yeah I did. I think I had 3 A's and a B over maths and science and I had a B in AS in maths.

FT: How did you first find out about the position that you applied for with Horizon Nuclear Power?

P2: Well, it wasn't really advertised like because I live _____ miles away in _____, so I tra-, well I live up in _____. So, I didn't hear anything about it until college said there was like an engineering fair apprenticeship thing in _____. And then, this is the only way I tried for because it was the only one that I like fancied. And then, because with this one like you can try everything first year, and then second year and third year are more specific. But like the other ones you just go straight into like one side. So, this is why I went into this one.

KO: What appealed to you most about the position?

P2: well, that really –laugh-

FT: Ok, what skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P2: At the moment we learnt a lot about like, we had to do like a presentation up in Wylfa in front of like the bosses and that so I like learnt a lot like about how to be able to do presentations properly and like give them to people and talk in front of people. Working with others, we do a lot of team work and that, but also like individual work we've had to be like very motivated in ourselves because there is a lot of work and that.

KO: Is it what you expected to learn?

P2: Yeah, really. But there is a lot like more as well to enjoy, that I didn't expect to be able to do.

KO: What do you think the most valuable skill you've learnt is?

P2: I don't know really because. I'm not sure really. Probably presentation because that's helped me most, because I was quite shy before.

KO: What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P2: Well, I think after the 3 years we get to go to like America or somewhere like that for like 2 years, training and that, but I would like to like go and do like a Masters but in Engineering, because I think that would help like my career pathway more.

FT: Would you recommend this scheme to others?

P2: Yes

FT: Why?

P2: It's just a really good opportunity. Like, especially with Horizon like because it's such a big company there is so much opportunity as well. Like we are going to Japan sometime and it's going to be amazing really.

KO: Do you think your secondary school did enough to promote careers in STEM?

P2: No, not really.

KO: What do you think they could have done more?

P2: Well, like up here I have been with like college and work and that to loads of like schools like promoting it and everything. And up here it's a big thing, but there was nothing like that at my school.

Participant 3:

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P3: I went to _____ school and I did GCSEs in triple science, geography, history, and then Welsh, English, and maths. And then I went to sixth form and I redid the first year twice, doing physics, chemistry, and Maths. I didn't pass it the first or the second time –laughs-. Sixth form wasn't for me.

KO: What about sixth form did you not enjoy?

P3: The teachers were ok, just that some of them were absent a lot. So, we had a chemistry teacher and she went off in, I think, October so we had one and she spoke French and not very much English. So, trying to learn chemistry in English is hard enough, let alone in French –laugh-, so that wasn't very good.

KO: You must have like chemistry enough to preserve with it though

P3: -laugh- yeah

FT: How did you first find out about the position that you applied for with Horizon Nuclear Power?

P3: My friend in sixth form told me about it. Our school didn't really know anything about apprenticeships. They were a uni school. So, then I applied and then I got it and she didn't unfortunately, so.

KO: What appealed to you most about the position?

P3: Being paid to go to college. Basically, because I did go to _____ uni to do nuclear physics, but my grades were not good enough. Then I saw this and I was like "Oh I don't have to go to sixth form anymore, I'll do this instead" so.

FT: What skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P3: I've learnt a lot about using machines, because I didn't do any engineering before I started so coming in here was like "oh god, ok, how do I put a drill on". So, I've learnt stuff like that and I've learnt that how important teamwork is, because we are doing our project now and we didn't really do teamwork in school so.

KO: Which do you think is the most valuable thing that you have learnt?
P3: Probably the teamwork skills. You don't realise how important it is when someone else doesn't do their work. The whole team goes down, yeah.

KO: You mentioned before that your school didn't offer much, did it offer engineering as an option?

P3: It did as a once a week in this college, but we had to travel, so we wouldn't - - and with our columns either you do the Sciences or you do something else. So, it was kind of physics or say Chemistry, so I didn't pick it –laughs-

KO: What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P3: I still think I want to go to university. You can do a, I think it's a, higher BTEC diploma. So, I think I still want to go a higher education, but I don't really want to go into the industry just yet.

FT: Would you recommend this scheme to others?

P3: I would yeah, I have. Three of my friends have applied. Yeah, hopefully –laughs-.

KO: Why have you recommended it?

P3: I just think it's good to be paid whilst you're still with your friends in your college, but you're still learning. Like, we don't do the same courses as other classes do, but I don't know if I call them classes –laughs-.

FT: Do you think your secondary school did enough to promote careers in STEM?

P3: No, not at all.

FT: How do you think they could have improved?

P3: By going to open days and stuff. Speaking to _____, she went to an open day with Horizon, and we didn't do nothing. Absolutely nothing. Or just trying to promote science maybe in general, they just don't care –laughs-. Sorry to dis High School, but no, it wasn't good.

KO: It's not a question on my list, but I'm quite interested: Obviously being a female, in engineering, how have you found it?

P3: Quite strange actually, because it's only me and _____ which when I went I was like "oh, there is only two of us". But no, hopefully a lot more girls will apply seeing us. Saying that I don't think many girls apply because they think "it's a boy thing". But no, I think it's fine. We're the bosses –laughs-.

Participant 4:

KO: Can you please tell me a little bit about your education prior to working with Horizon Nuclear Power?

P4: I stayed in school to do my GCSEs. I did Engineering Level 2 here, part-time, did all my core subjects like maths and science. Then I got my GCSEs in them, all C to A, A* actually, and then I went to sixth form then for a year and did maths, physics, and engineering level 3, part-time here. And then I found out about this and applied for this and then dropped out of sixth form then, half way through.

FT: How did you first find out about the position that you applied for with Horizon Nuclear Power?

P4: My dad told me about it, but then I had seen it advertised on the internet and so that is why I applied to it then.

KO: Ok, what appealed to you most about the position?

P4: Well, since a young age I wanted to be an engineer and this is where I wanted to be because my dad worked in the previous Wylfa power station, so I've wanted to follow his footsteps and go into the new one.

FT: What skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P4: A lot of hands on skills, a lot more than I used to in school. A lot of like writing log books and the electrical side of Engineering as well. I didn't get to do much of that in school.

KO: Was there a lot of difference between the GCSE/BTEC and what you are doing now?

P4: Yeah. There is just a lot more work now, because I used to be part-time in school and now we are getting it full-time, so we get more opportunities now really, yeah.

FT: What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P4: Well, I'm hoping to go on like placements on active power plants around here, to get more experience working on active power plants. And maybe go onto do a higher degree in engineering, or something as well. That would be good.

KO: Would you recommend this scheme to others?

P4: Yes, definitely. Definitely.

KO: Why?

P4: All the fun that we have on it, and all the opportunities that we get as well doing the work is good.

FT: Do you think your secondary school did enough to promote careers in STEM?

P4: Yeah, I think they did. Yeah.

FT: How?

P4: They made us do - - When I was in sixth form we did a lot of, what do you call it, like, volunteering for STEM and I was once made a STEM ambassador, where I'd do a lot of volunteering for my Physics teacher. So, yeah, that's what I did.

KO: What about STEM is so appealing to you?

P4: What about STEM is so appealing?

KO: Yeah

P4: I like getting the younger kids involved and making sure that they're aware of like the all the jobs that are like associated with the STEM subjects, yeah.

Participant 5:

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P5: GCSE, things like that?

KO: Yeah

P5: I did GCSEs in _____. I did triple science, additional maths, and level 2 mechanical engineering. Then, after that, I moved on to do A-Levels in this college. I did physics, maths, and psychology. Dropped psychology, I was terrible at it. Then I did a subsidiary in Level 3 mechanical engineering.

FT: How did you first find out about the position that you applied for with Horizon Nuclear Power?

P5: I just went to an evening. Said "hey, that's a lot of money, I'll sign up"

–laughing-.

KO: What appealed to you most about the position?

P5: well, reality, I actually always wanted to be an engineer. So, from, actually about a decade ago I said “hey, I want to be an Engineer”. About 5 years after that I said, “I want to be a Nuclear Engineer”. 5 years after that, eh apprenticeship for a Nuclear Engineer. I’ll take it.

-laughing-.

P5: I actually got into it, luckily so.

KO: How did you find out about it when you were that young?

P5: I don’t know, to be honest. I just heard the word engineer and was like “that sounds cool, I want to be one”

-laughing-

FT: What skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P5: Work as a team. Because I’m not usually one to work as a team, I’m more of just a solo person. But stuff doesn’t work like that, so.

KO: Was working in a team something that you were expecting?

P5: Sort of. They said “oh yeah, you’ll have to get along with people, like don’t do that”.

-laughing-.

P5: But yeah, it’s definitely helped trying to work as a team.

KO: Do you think it is the most valuable thing that you have learnt through the scheme?

P5: Yeah

KO: Are there any other skills that have come through?

P5: Just communication, talking to people you don’t know.

-laughing-.

FT: What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P5: The 3 years that we do the actual Wylfa Newydd won’t be built. So, if they actually let me through, the few years that we have after that they will be sending us around nuclear power plants. After that, then I will sign up for the Wylfa Newydd and hopefully get the job.

KO: Would you recommend this scheme to others?

P5: Yes.

KO: Why?

P5: Because it's good. Nah, it actually does teach you quite a bit. Even my brother, he doesn't have any interest in Engineering or the nuclear side of the world, but I told him to sign up for it anyway. He didn't.

-laughing-.

P5: But, yeah it does teach you a lot of valuable knowledge. Like how machinery works. How just health and safety in the business world does work and does teach you a lot of valuable skills. And, hey, money in your pocket so.

KO: Do you think even if you didn't want to go into a career, in sort of a nuclear power plant, it would be a good scheme to enrol on?

P5: It's definitely a good thing if you do, actually it's a great thing, if you do want to go into the nuclear industry and Engineering side of things. But, it's still a very good opportunity, even if you don't, so.

FT: Do you think your secondary school did enough to promote careers in STEM?

P5: Yeah, I'd say so. But it could have done more. But yeah.

KO: How did they promote it?

P5: Just random evenings spread around just "hey, you come to this" and I don't get a choice. But, oh well.

KO: Did you engage many of the things they had on offer?

P5: A little bit. A lot of it wasn't really that interesting to me.

KO: Did you come across Horizon Nuclear Power in any of the stuff that they did do?

P5: No, I don't think so. I've learnt about that last year.

Participant 6:

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P6: I did geography, RE, and triple science in GCSE. I did the sixth form doing maths, engineering, and physics. And then came straight to this.

KO: Why those subjects?
P6: in GCSE, I just didn't know –laughs-. They were the easiest ones. Na. And A-Level I knew I wanted to do something along the lines of engineering but I didn't know what yet.

FT: How did you first find out about the position that you applied for with Horizon Nuclear Power?

P6: I went to an opening evening in _____, and then. Yeah, the advertising. And I put my email down and just applied.

KO: With the open evening that you went to, was it an advertisement that drew you to it? Or was it something you found out through school? Or?
P6: I just. I think my sister saw it on Facebook or something and she just told me to go to it.

FT: What appealed to you most about the position?

P6: It's local –laugh-. I don't have to go away to work.

KO: What skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P6: Well, practical work, I would say. Mainly that, and possibly communication –laugh-. Possibly.

KO: What do you think is the most valuable thing that you have learnt?

P6: Practical probably. Yeah.

FT: What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P6: Hopefully still working –laugh- in that company. Hopefully.

KO: Are you planning to travel around the plants? Or?

P6: Yeah.

KO: Would you recommend this scheme to others?

P6: Yeah, definitely.

KO: Why?

P6: Good money and it's local. Yeah.

KO: If it wasn't local, do you think you still would have done it?

P6: Probably not, no. No.

KO: Do you think your secondary school did enough to promote careers in STEM?

P6: Yeah. I'd say so. Yeah.

FT: How?

P6: With like mock interviews, with different companies and things like that. I had one with Magnox. So yeah.

KO: Would you have changed anything about the way they promoted it?

P6: No. Not really. No. It's ok as it is, I'd say.

Participant 7:

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P7: So, I attended secondary school in Ysgol _____ and I did all my GCSEs and I did have a thought about going to sixth form but I didn't.

KO: What GCSEs did you do?

P7: I did design and technology, RE. What was the other one? I did all my core subjects, and I also attended this college, part-time, to do level 2 engineering as well.

FT: How did you first find out about the position that you applied for with Horizon Nuclear Power?

P7: I had a mock interview, through the school, as a practice run sort of thing. And then they also had the career event with different companies, and there was a STEM section and Horizon was actually one of the companies that were there. And they said they were launching an intake of apprenticeships for the first year, so I applied.

KO: Just to clarify: your mock interview was with Horizon Nuclear Power?

P7: Yeah. With an actual employee for them. Yeah.

KO: What appealed most to you about the position?

P7: Just what it offered really. Because I knew that I wanted to do engineering and to pay to learn about it was perfect really.

FT: What skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P7: There is a lot of teamwork involved but there is also a lot of using your own initiative as well, so that's a good contrast. So, communication skills, you learn a lot of communication skills day to day.

KO: Was it what you were expecting it to be?

P7: Yeah, and more if I'm honest. Because we get to go, sort of, look at other sites as well that are not nuclear based so that's good as well.

FT: Which skill do you think is most important?

P7: Probably teamwork. Because in the interview they looked at how you performed in a team. They didn't care about if you finished the task or not, it was the skills you used.

KO: Were you expecting it to be as teamwork based as it was?

P7: Yes and no.

KO: In what why?

P7: I knew that working in a team would be something that they looked for, but they also looked at independency within in a team as well. If that makes sense.

FT: What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P7: I've had a thought about going to uni, but I think I would much rather finish the apprenticeship scheme and go straight into work.

KO: So, did you come straight from GCSE?

P7: I did, yeah.

KO: Would you recommend this scheme to others?

P7: Yeah.

KO: Why?

P7: If you know that you want to focus on engineering, and that's the career that you want to go in, then being paid to learn about it is just brilliant. Couldn't ask for more really.

FT: Do you think your secondary school did enough to promote careers in STEM?

P7: Yeah.

FT: How?

P7: They held 2 career events. They held 2 careers events every year and they also give us mock interviews and like an employment sessions as well. So, they'd talk with you what you want to do after you leave school, so that helped that. Yeah.

KO: Have you been going into schools with Horizon too?

P7: Yeah.

KO: Have you been enjoying that?

P7: Yeah. That was good. Yeah.

KO: Do you think it is really valuable hearing the views of the scheme from someone who is currently doing it?

P7: Yeah. Yeah. It helps a lot.

Participant 8:

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P8: Well, I just left my secondary school in _____ and I did Maths, all the - - English, and science for GCSEs. But I picked history and design and technology as my like - - the other ones that I done for my curriculum. Then I came straight from my GCSEs to here.

KO: Was there any particular reason why you didn't want to do A-Levels?

P8: Well no. I got it straight from GCSEs, so I came straight from Year 11 to here. So, I didn't have a chance really.

FT: What GCSEs did you do?

P8: Maths, English, Welsh, D&T (design and technology), IT, history. Yeah that's it.

KO: Is IT a core subject in Wales?

P8: Yeah. Last year - - the year before me you didn't have to do it. But when they changed it for our year we had to.

FT: How did you first find out about the position that you applied for with Horizon Nuclear Power?

P8: I feel my school was quite like in with it and were quite - - and trying to give it across as a good idea and a good sort of pathway to go down. But then my dad was also trying to push

me towards it as well and had seen it in the newspaper. And, just sort of seen it around, It was publicised quite well so.

KO: Do you have engineers in the family?

P8: Everyone. My dad, my brother –laugh-. It was going down that route anyway and I wanted to do the same so it just fits in nicely.

KO: What appealed to you most about the position?

P8: If I was being honest, it pays well –laughs-. I'm not going to lie. It's also what I want to do and it's close to home. It's not far down the road from where I live so.

KO: If it was further away would you still have been - -

P8: yeah, it's a good opportunity for work. Work is hard to find these days so. It's just a bonus that it is closer to home.

FT: What skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P8: I've learnt quite a bit actually. I've learnt how to use certain machines and stuff in the workshop. I've learnt certain techniques to use on different materials in the workshop as well. But I have also learnt how to do circuit diagrams and understand how to read Engineering drawings and stuff like that.

KO: What do you think is the most valuable skill that you have learnt?

P8: Probably to read Engineering drawings and understand - - so if you were given a job and it was to design measurements, you would have to understand it without instruction.

KO: Having come straight from GCSE, do you think that you have learnt more from this apprenticeship than you would have through A-Levels?

P8: Yeah. I never really wanted to do A-Levels, I would have come straight to college anyway to be honest. But, I feel this is more sort of real life than A-Levels.

FT: What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P8: Well, hopefully stay with these. Well, it's my choice - - if I pass and stay on the course, I will stay with these for the rest of my life if I can –laughs-. No guarantees.

KO: Would you recommend this scheme to others?

P8: Oh yeah, Definitely. I wouldn't choose to do anything differently.

KO: Why would you recommend it?

P8: It's just, like I said, it prepares you for real life and it makes everything - - I found A-levels are still like you're in secondary, with teachers chase after you for you to do your work, But I college you're left alone to do your own work in your own time. And it just makes you ready.

KO: Is the independence the bit you enjoy the most?

P8: Yeah, I like to be independent. I like to do my own thing. I like to have my own time and no set schedules.

KO: How are you finding the teamwork aspect of the course?

P8: -laughs-. It's not too bad.

KO: Were you expecting there to be a lot of teamwork?

P8: Yeah, it is a lot of teamwork. My dad was saying that with his work there is a lot of teamwork over there so he was he pushed me towards a lot of student group work. It's not bad.

KO: Do you think this mirrors what you'll get to experience in the real-world power plants?

P8: Yeah, well I think this - - well next year we are going to have placements and stuff around England and stuff like that. So, I can't wait for that. It'll be interesting.

FT: Do you think your secondary school did enough to promote careers in STEM?

P8: Well, when I was in Year 10 I would have only first heard about it. They do do it now, from what I have heard. But when I was there they didn't do much about it to be honest, it's only been the last 2 years.

FT: What do you think they could have done to improve?

P8: They could have done a lot more experiments to sort of involve all 4 aspects as one activity. They didn't do much.

KO: Did you encounter Horizon Nuclear Power a lot whilst you were at school?

P8: They came once to give a presentation about what the plant was going to be and what opportunities that were on the way. So, but they didn't do much, at that moment.

KO: Were there many sort of STEM professions that were pushed?

P8: Science was highly pushed in the activities that we did, but emphasised a lot on maths. But engineering in my school was - - unless you did in the workshops in my school there wasn't empathised.

KO: Did they offer it as a GCSE option?

P8: Yeah. But, when I was doing my GCSEs the way you picked it, yeah the columns. Double science and engineering clashed so I couldn't have them.

KO: Do you think that's one of the main reasons that people don't take engineering?

P8: Yeah. I wouldn't have been able to get onto this course if I didn't do the double science. So, I found it more important than doing engineering.

Participant 9:

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P9: I went to Ysgol _____ in _____for six years. I did one year of sixth form before I - - and I eventually got this apprenticeship, so I left the school. When I was in school my GCSEs I chose triple science and engineering. And I guess, So I guess that's where my love for engineering you could say came from.

KO: What about A-Levels? What did you do in your first year?

P9: I did physics, maths, and I did engineering level 3 then. So.

KO: So you were always really into the STEM stuff?

P9: Yeah. -Laughs-. Yeah.

KO: Was there any particular reason why you liked STEM, as a sort of cluster?

P9: Everything is to do with engineering now really isn't it? And there is always going to be a job somewhere, even if it's not with what I am doing now. They'll be a job somewhere. I guess, when I did my work experience in Wylfa, I guess that kind of made me decide "yeah, this is what I want to do for the rest of my life".

KO: Was that during GCSE?

P9: In Year 10, yeah.

KO: Did you do quite well with your STEM subjects? Is that what sort of motivated you to carry on?

P9: I did reasonably well, I'd say, yeah. I'm happy with what I got.

FT: How did you first find out about the position that you applied for with Horizon Nuclear Power?

P9: My dad. He had seen - - well, he was on the indeed job website, or something like that, looking for jobs for himself and saw that there was a Horizon apprenticeship coming up and he told me about it. Because I had applied for a nuclear apprenticeship with a company the previous year, but wasn't successful. So, I tried for this one and was fortunate to get it.

KO: Do you have engineering in the family? Direct Family?

P9: One of my uncles in a train engineer, down in _____. So, he deals - - so he was - - started off as an apprentice, like fixing up the trains and bits and bobs and that. And then now he is building his way up and is now some sort of manager.

KO: Is that were the interest stemmed from? Or?

P9: Yeah. Yeah really yeah. Because, what my dad does I want to say - - he works in a supermarket. And I don't want to do that for the rest of my life, so –laughs-. I was. Yeah. I guess, yeah.

FT: What appealed to you most about the position?

P9: Where it could lead for in the future. Because, it's a job for life if the plans go ahead. And it's definitely a job for life.

KO: Why specifically this, rather than a level 3 engineering A-Level?

P9: Well, apart from the fact that I get paid to do it –laughs-. It is because the opportunities after we finish because obviously I'm level 2 right now, so it covers everything to do with engineering really and it's quite interesting. Then next year, we're are doing level 3 anyway in a subject we think we are the strongest at or we do better in this year. And then third year is placement in a power station, I imagine, so it's just the experience I get. Then hopefully, after that it might be - - the company might pay for me to go to uni hopefully. Or I might do more placement, just to gain more experience through that.

KO: Would you do an engineering based degree? Is that the vision?

P9: Yes definitely. If I got the offer I would definitely do it.

FT: What skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P9: There is a lot like - - working within a team, I'd say. I've done a lot of like teamwork in school and stuff like that but what we are doing right now - - we are doing an EESW, which is a STEM project and that kind of taught me a lot of things. Like different things to do with engineering. Rather than most of what we do is mostly on machines and this is like fault finding and coming up with our own ideas and ways of getting around it and all that. So yeah, that's what I've learnt I'd say.

KO: What is the most valuable thing that you have learnt? If you were to pick a specific skill?

-laughs-.

P9: That's quite a difficult one actually. I don't know.

KO: You can pick multiple –laughs-.

P9: I've enjoyed most things. I've been doing a bit - - I don't know, I think the most valuable thing that I've done has probably been working and communicating with others, that's probably the best thing I can say.

KO: Is it what you were expecting it to be?

P9: No. It is better than I thought it would be.

KO: In what way?

P9: I wasn't too sure what to expect. I had a rough idea because I did engineering in college and I was expecting it to be similar to that. But it was way better than that, basically. Yeah.

KO: We've sort of a covered this before, but I'll ask it anyway just in case it sparks some inspiration. What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P9: Hopefully, go to uni and do some sort of engineering degree. If not, then it will be placements around other power stations to gain experience before then one I will hopefully work in will be open.

FT: Would you recommend this scheme to others?

P9: Definitely.

FT: Why?

P9: It is a great opportunity. If anyone is lucky enough to get the offer then they would be stupid to say no. So, yeah.

KO: Do you think it is valuable to people who don't particularly want to work in a power station, but could perhaps gain skills - -

P9: I would say yes, but I don't think that's what the company wants

KO: No, but the apprenticeship theme - -

P9: Oh, I would say if you are not too keen on uni, then definitely an apprenticeship is the best way forward. You'll gain a lot through that and learn a lot more than just staying at school or doing engineering in college.

KO: Do you think your secondary school did enough to promote careers in STEM?

P9: I'd say the school itself didn't have a lot of like events going on within the school. But, they did like have flyers and posters going around, telling us they were. Like I went to _____ _____ to do a - - they had like an open event, with loads of different companies. They had like leaflets going around for that. But, they didn't have much stuff coming into the school itself to promote it.

FT: Do you think that they could have done anything to improve?

P9: I think they've already done it now actually, because when we were doing - - we were going around schools to promote it and then I've been to about 3 to my old school now. Horizon were there and a few other companies were there as well. So, they have definitely improved since I was there.

KO: Do you think it is important for them to see someone their own age, who is quite recent into the scheme? And enjoying it? And - -

P9: Yeah, definitely. It makes a difference because - - well, they're closer to my age so they'll listen more and they'll understand, rather than an adult who's been mouldering for ages.

-laughs-.

Participant 10:

KO: Can you tell me a little bit about your education prior to working with Horizon Nuclear Power?

P10: Ok, so I went to Ysgol _____, in _____. I picked triple science, art, and geography. Then, after doing school, I went to college to do A-Levels. I studied physics, maths, and psychology. And I passed on the physics and psychology, I didn't do well in maths. But, Yeah. Then I applied for here, and got in here.

KO: You did quite STEM-based A-Levels, what was the motivation for that?

P10: Yeah, I wanted to be an astrophysicist. But, then I saw I needed 3 A*s for the uni I wanted to go to so I decided that an apprenticeship was probably easier.

KO: What uni did you want to go to?

P10: _____ –laughs-

KO: So leaving home wasn't an issue?

P10: No, no. –Laughs-

FT: How did you find out about the position that you applied for with Horizon Nuclear Power?

P10: I actually went to an open evening in _____. I needed a Plan B for when I realised that A-Level wasn't for me. And I applied for a few and this is the one that I ended up getting. So, I really happy with that.
KO: What appealed to you most about the position?

P10: It's more hands on than what uni would have been, and I like hands on work. It's a lot better being paid to learn and not to pay to learn, so that's a lot nicer –laughs-. I get to stay home, stay on the Island, which is fun. And there are huge opportunities with the actual apprenticeship, so.

KO: Do you have engineering/astrophysics in the family?

P10: Yeah. My dad is an electrical engineer. My uncle is a chemical engineer, and my taid was an electrical engineer as well.

KO: Is that what set the - -

P10: I don't know. I never really was like "oh, I'll strive to do this". I just in secondary school saw what I was good at and, you know, what I enjoyed. So, I kind of went that route. So, yeah.

FT: What skills have you learnt through the Horizon Nuclear Power apprenticeship scheme?

P10: Just engineering –laughs-. engineering skills, working with teams a lot. Meeting new people, which is good. I'm getting on with a lot of people that I wouldn't necessarily usually get on with, so that's good.

FT: What do you think is the most important skill that you have learnt?

P10: I don't know. I couldn't tell you. Just all of it.

KO: Is it what you expected it to be?

P10: No, but it's better.

KO: In what way?

P10: There's - - I don't know - - It's just I thought it was going to be a lot, like more heads down, work constantly, no fun. But the teachers are a lot more like fun, and you know, _____is, you know, doing it really well and everything. And it's just like everything has gone together really well and it's just worked.

KO: You enjoying the different aspects of it? And going into schools and promoting the - -

P10: Yeah. Yeah it's really fun and like the variety that we get. It's just like I'm never bored, because we - - one day we are doing something and the next day we are doing something completely different, and it's quite nice. It's a lot different from like 3 hours in a classroom listening to a teacher talk –laughs-.

FT: What is the next career step for you once you finish the Horizon Nuclear Power apprenticeship scheme?

P10: Hopefully go on work placement and then hopefully work for Horizon for a lot of my life. And then, you know if that gets boring move on. But stay in engineering, I think.

KO: Not tempted to go back to uni and do astrophysics?

P10: I'm tempted, but I just don't think I could do it –laugh-. Not after, you know, doing a lot of practical and then I couldn't go back to the classroom. It just wouldn't work.

KO: Would you recommend this scheme to others?

P10: Yes, definitely.

KO: Why?

P10: It's just the best opportunity I've had. And, like I said, you're getting paid to learn instead of paying to learn and living with loads of debts. And –laughs- -- just tell me if this hits too close to home –laughs-. But no. Yeah, I've learnt so much and the people here are great, and just working with a company at such a young age is great. And everyone has told that they wish they had this opportunity. So, take it while you can if you're interested.

KO: Do you think your secondary school did enough to promote careers in STEM?

P10: They did ok. My secondary school wasn't like the top notch. But, you know, I knew what I was doing from an early age because my parents helped me a lot. But secondary school - - if I had any questions they would answer, but they didn't like, you know, shove it in my face. They were sort of open to whatever we wanted to do.

KO: How do you think they could have improved?

P10: Give like, you know, more out there carers. Because there is always "oh you can be a doctor if you choose these" or, you know, the more general careers. But they didn't like tell us about like "oh, if you study this certain subject you can actually do something completely different", but it helps a lot, so.

KO: Would you rather of had careers fairs, where you could do from business to business, or would have liked to have hands on experience?

P10: Yeah, because I got that in college, and that helped me to get this. But in secondary school, I didn't have any of that. So yeah, definitely in secondary schools you need a lot more careers advice.

KO: Did your secondary school offer any work experience?

P10: Yes.

KO: Was that something that was particularly valuable?

P10: That's a bit awkward for me as well. I applied to do work experience in Wylfa, but they lost my application. So, I just did work experience at my job. So –laughs--. So it wasn't really new work experience, it was just me working.

KO: But the school did give you the option?

P10: Yeah, yeah. They gave us good options it was just a mix up, you know, forms, it wasn't too bad.

Appendix P: Semi-Structured Interview Questions

Semi-structured interview questions

Demographics:
Participant number:

Date of birth:

Gender:

Secondary school attended:

Interview questions:

1. Can you tell me a little bit about your education prior to working with Horizon Nuclear Power? (Prompt: did you do GCSE's, A-levels ect.?; subjects and grades)
2. How did you first find out about the position you applied for with Horizon Nuclear Power?
3. What appealed to you most about the position?
4. What skills have you learnt through doing the Horizon Nuclear Power apprenticeship/graduate scheme?
5. What is/was the next career step for you once you finish the Horizon Nuclear Power apprenticeship/graduate scheme?
6. Would you recommend the scheme to others?
    a. If yes, why?
    b. If no, why not?
7. Do you think your secondary school did enough to promote careers in STEM?
    a. If yes, how?
    b. If no, how do you think this could have been improved?