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Exploring whether implementing strategies that promote the value of DT increases the uptake at GCSE

Jemima Snelson

(PGCE Secondary/Design and Technology, 2022-2023)

email: jemima.snelson@icloud.com

Abstract

Iterative research was conducted to establish factors which have contributed to the dramatic decline in the number of pupils selecting GCSE Design and Technology- "a decrease of over 50% since 2011" (Joint Council for Qualifications 2018). The literature review and data collection indicated many factors that may have resulted in the decline of entries within GCSE DT, such as the lack of creativity and real-world problem-solving in Design and Technology projects and the implementation of the EBacc in 2011, which promotes some subjects as more valuable than others. The study intended to address if a 'values-driven intervention' would encourage more pupils to study GCSE Design and Technology. The values driven intervention increased willingness to take D&T at GCSE, with a 100% increase in the number of pupils wanting to study DT GCSE.

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Exploring whether implementing strategies that promote the value of DT increases the uptake at GCSE

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Introduction

Design and Technology (DT) is a school subject offered at all levels of primary and secondary school in England. It first appeared as a titled subject in the first National Curriculum of England, Wales and Northern Ireland in 1988. According to the UK Department for Education (2013), DT "prepares pupils to participate in tomorrow's rapidly changing technologies". Pupils learn to think creatively to solve problems as individuals and as a team. They learn to identify and solve problems, through designing and making products that are fit for purpose (ibid.). It is also an increasingly popular subject in higher education, with many universities offering degree programs in fields such as Product Design, Industrial Design, and Engineering. Despite this, there has been a dramatic decline in recent years in the proportion of students opting to study DT at both GCSE and A level. The rate of decline is accelerating nationally, "only 18% of students chose to study DT at GCSE in 2018, a decrease of over 50% since 2011" (Joint Council for Qualifications, 2018).

There is very little evidence regarding the factors which deter students from studying DT. Thus, the literature review was conducted to explore why students are not picking DT for GCSE and the values attributed to DT. The aim of the research was to establish if a 'values-driven intervention' would encourage more pupils to study GCSE Design and Technology. The research methodology used to investigate this was drawn from action research. A questionnaire was devised to measure how many pupils currently wanted to study GCSE DT, and the reasons behind their decision. A series of five lessons were then conducted which centred around the values of DT identified in the literature. The lessons were project-based and centred around careers that can lead from studying DT. A further questionnaire was then conducted to evaluate if the 'values-driven intervention' had impacted the pupils' desire to study GCSE DT. Semi-structured interviews were then conducted to gather data on the more intangible aspects of the values of DT, e.g., values, assumptions, beliefs, and concerns.

The findings showed the 'values-driven' intervention was successful at increasing the number of pupils opting to study GCSE DT. Prior to the intervention, only 18.2% (n=4) of pupils intended to

study GCSE DT. After the intervention, there was a 100% increase in the number of pupils wanting to study DT GCSE, with 38.1% (n=8) answering yes, they would choose GCSE DT.

In this essay, I will first present a review of the literature, before detailing my research design and methodology, reporting, and discussing key findings and offering key takeaways to inform teaching practise. This literature covers important aspects of my research project. I will explore the first research question, 'Why are students not picking DT for GCSE?'. The next step will be to partially answer the second research question, which is 'What are the existing values that Y8 students attribute to DT'?

Literature Review

Research Questions

Establishing the research questions enabled the parameters for selecting the literature to be constructed. The parameters are as follows; the literature should be published in one of the following formats: a peer-reviewed journal, a book or official government documents. The research also needed to include the key term Design and Technology (DT). To ensure that the literature is relevant the literature needs to have been published since 2010, as there have been major changes in the DT context, for example, the introduction of the EBacc since then.

Why are students not picking D&T for GCSE?

DT has the potential to be at the forefront of innovation, providing solutions to real-world problems through the fusion of creative and technical skills. However, in recent years, there has been a decline in interest, highlighted by the dramatic fall of 71% from 270,400 candidates in 2010 (The Manufacturer, 2022). This section of the report will explore some of the reasons why DT is declining. The literature suggests that a prominent reason why there is a decline in DT is that the first DT National Curriculum was developed in 1990, so DT is a relatively new subject. The National Curriculum designed in 1990 united the diverse areas of woodwork, metalwork, sewing, craft, design, and technology (CDT), technical drawing, and home economics. However, these subjects had been regarded in many schools as "at best as a pre-apprenticeship grounding in handicrafts, and at worst as the 'sink' subjects in schools with academic pretensions, providing a half-hearted vocational

alternative to pupils" (Miller, 2011, p.1). When DT was implemented in 1990 it was given a prominent position in the National Curriculum, becoming the first country to implement compulsory DT education. Initially, all 16-year-olds were required to take a GCSE in DT. Until 2004 Design Technology was a compulsory subject up to Key Stage 4. Since DT lost its compulsory status the number of students opting to study the subject dropped significantly (ibid., p.3). The fact that DT is a relatively contemporary subject means it was not studied by many parents and employers making it poorly understood by the general public and this will contradict student enthusiasm for the subject. Taking a different stance, the literature does not allude to the fact that DT is a disjointed subject that awkwardly unites diverse areas such as woodwork, metal work and food technology. In my experience, pupils will often study DT on a rotation of Food Technology, Textiles Technology, Resistant Materials and Systems and Control. If they do not like one aspect of DT, they may be put off choosing the subject at GCSE.

The decline in GCSE uptake may be attributed to the fact that GCSE DT is perceived as less difficult than more traditionally academic GCSEs, such as Maths, English and the Sciences. A study conducted by Coe (2008) utilised the Rasch model to measure individual ability and exam difficulty in thirty-four GCSE subjects. GCSE DT was one of the easiest subjects using this method, with Latin as the hardest Coe (ibid.). There are limitations which were recognised in the study, for example, a student may do well in a subject due to excellent teaching, or good revision techniques rather than because it is easy. According to (Leahy & Phelan, 2014, p.382), Design Technology education, as "an academic subject, is classified by many as a subject for those who are 'intellectually less capable". This argument is strengthened by the research of Coe who found pupils are often aware of the academic value associated with GCSEs in subjects such as Latin; and therefore, are put off taking DT. This perception could be reinforced by parents or teachers who may not place as much emphasis on the subject. Many of these perceptions held today surrounding DT stem from DT being inextricably bound to its vocational history is often associated with 'fixing things' or 'woodwork'. As a result, DT may not be considered by some to be academically rigorous and may not be held in the same regard as Maths and Physics.

The literature also indicates the implementation of the English Baccalaureate (EBacc) in 2011 could be a predominant factor in the decline of DT as it implies that some subjects have greater value than others (Hardy, 2018, p.56). The EBacc measures pupil progress in five subjects (English, Maths, Science, a language, and a humanities subject) and excludes creative subjects. The EBacc was

introduced in 2010 by the UK government to encourage students to study a core set of academic subjects and improve their overall academic performance. However, critics such as Hardy (2018) suggest the EBacc implies that these five subjects are more valued than others "due to their epistemology and their role as gatekeeper subjects; suggesting they open more doors to higher education and high-earning careers than other subjects" (ibid., p.56). According to the research of Hardy since the introduction of the EBacc, there has been a dramatic fall in the number of students choosing to study DT as with fewer subject options available for the remaining subjects, fewer students are studying DT. The literature does not reference another detrimental factor caused by the EBacc; schools are under pressure to focus on EBacc subjects to improve their overall performance, and as a result, they may reduce the amount of time and resources they devote to DT.

Regardless of the implementation of the EBacc, some schools may not have the resources or funding to offer a comprehensive DT curriculum, which may impact pupils' interest in the subject. Schools are experiencing significant funding pressures, school budgets were increasing in real terms until 2011, however, since then spending per pupil has dropped 8%. Since then, DT uptake dropped significantly, with "only 18% of students choose to study DT at GCSE in 2018, a decrease of over 50% since 2011" (Joint Council for Qualifications 2018). As such, schools are faced with the challenging task of balancing budgets "teaching DT is expensive, not just in terms of space and raw materials but also equipment of increasing sophistication: high spec computers for CAD, 3D printers, and laser cutting machines; therefore, it is tempting for curriculum planners to reduce it to a boring, traditional subject" (James Dyson Foundation, 2019). Likewise, Roberts (2022) provided some evidence to support that the limited resources and funding have played a pivotal role in the decline by highlighting that GCSE students attending free schools and sponsored academies are less likely to enter D&T, while at A level, students in independent schools are most likely to enter the subject. Noting the above discussion, this can be assumed to be a result of having resources and high-tech equipment that enables DT to reach its potential as a subject at the forefront of innovation.

The literature also identifies that the decline in DT could be because projects do not always facilitate creativity and choice. Concerning DT, the projects that have been found to motivate and inspire pupils the most are, "real-world problem-solving, and self-selected topics" (Renzulli, McCluskey, & McCluskey, 2014, p.4). However, the literature and my own experiences in schools have shown this is not always the case, "as outcomes were highly predetermined, with an emphasis on craft and the acquisition of practical craft-based skills, all of which allowed students very little opportunity to be

creative" (McLellan & Nicholl, 2008, p.596). This study conducted by McLellan and Nicholl interviewed 14 DT teachers and conducted an open-ended email survey with a further 17 DT teachers. The study concluded that teachers of DT do indeed struggle to implement both the creativity and performativity policies. McLellan and Nicholl (2008, p.585) attribute this to the pressure to be seen to be performing in school league tables and doing well in Ofsted inspections meant the teaching of D&T limited the opportunity for creative learning. This results in constricting briefs set by teachers which limit pupils' opportunity to come up with original and novel designs (McLellan & Nicholl, 2013, p.197). This means pupils do not utilise creativity and explore design, but rather, craftmanship, which may detract from their enjoyment of the subject, or lead to perceptions DT is just for carpentry, and has no value for careers such as fashion design or engineering.

Overall, the literature review indicates that the decline of DT is a multifaceted issue that involves many factors, most notably; the implementation of the EBacc, and its vocational perception. The multitude of factors has created a perfect storm where DT has struggled to shake off its vocational perceptions and has also struggled to fulfil its potential as an innovative, futuristic, and valuable subject. This leads us to the next section of the literature review; exploring what values are attributed to DT.

What values are attributed to GCSE Design and Technology?

The next section of the literature review is going to address the second research question: 'what are the existing values that Y8 students attribute to D&T?'. This is going to be achieved by reviewing literature which discusses the values which are more generally attributed to DT. This will inform the methodology implemented to identify what values Year 8 attribute to DT. It will also be beneficial to compare the values identified in the literature to the values attributed to DT by Year 8 pupils.

As previously touched upon, a consequence of school performance measures such as the EBacc and Progress 8, is that some subjects are prioritised over others, which implies some subjects have greater value than others (Hardy, 2018). Value is a complex construct to define, I am going to be using Rokeach's definition as, although it is from 1968, it has been used by established researchers in education. The definition is that "a value is an enduring belief that a specific mode of conduct or end-state of existence is personally and socially preferable to alternative modes or end-states of existence" (Rokeach, 1968, p.160). This definition considers that a person's values originate from a belief and

result in an attitude. When applied to DT, this paper argues that DT is valued as a lesser subject than others, such as Maths and Physics.

The most notable literature which addressed the values pupils attribute to DT was conducted by Wooff et al. (2015), who utilised the PATT (Pupil Attitudes towards Technology) instrument (Ratt & de Vries, 1986), and which was developed in the Netherlands and used in Europe to investigate pupil perceptions and concepts they had of technology. PATT studies utilise the five following instruments: an attitude questionnaire, a concept questionnaire, qualitative methods i.e. essays, and a technology attitude scale. Wooff et al. (2015) yielded responses from 561 pupils from 173 different schools across the UK. The results showed that the majority of pupils enjoyed DT. However, the pupils did not value the wider implications of the subject and the importance of it for future careers. The study also found that pupils found the work too easy, decreasing its value as a subject.

The literature suggests personal development is a key value of DT. This is because the pupils develop soft skills such as teamwork, communication, and leadership. Through project work, they also develop confidence, resilience, and self-efficacy. This is a persistent theme running through the literature as Hardy (2019) also recognises how DT supports a child's personal development and gives students a sense of enjoyment, satisfaction and fulfilment. Hardy also identifies generic and transferable skills that are developed from studying DT. The skills identified include thinking skills, creativity, problem-solving and communication. These skills will aid pupils in whatever career or vocation they chose to follow.

Another value that Hardy (2019) identifies is how DT meets individuals' and society's economic and domestic needs. Hardy's research into the values of DT showed that many people value the everyday life skills taught in DT as well as learning skills to use in future related D&T jobs. DT contributes to the country's international industrial and economic competitiveness. Moreover, the literature identifies that technological awareness is a fundamental value of DT. The National Curriculum states DT enables' pupils to be aware of the impact of technology' (Department for Education, 2013). Technology has become a huge part of our daily lives and Hardy (2019) explains that it allows pupils to have a critical understanding of the impact of products on society. Hardy's research argues creating and recognising good design is the central value of DT. In DT pupils are exploring problems, and get hands-on experience making and creating, but also learn about society's diversity by designing for multiple situations and contexts.

The literature identifies that, when fully compliant with the National Curriculum, DT promotes innovation. It enables pupils to think creatively and create innovative solutions to problems. In DT lessons, pupils identify problems, generate ideas, and create design solutions that meet the needs of users. Furthermore, the James Dyson Foundation (2019) identifies that a value of DT tool for developing problem-solving skills. Through the design process, pupils identify problems which affect their community and develop solutions to effectively solve them. This also exposes students to social, economic, and environmental problems and impacts which can be applied to various real-world situations. An example of this I have observed in school is designing prosthetics for a quadruple amputee, Alex Lewis.

Conclusion

In conclusion, DT is a subject that promotes innovation, problem-solving, and personal development, which in turn helps the economy. At present the design economy is growing at twice the industry average in the UK, however, this will not continue with the number of students picking GCSE DT dropping. It enables students to think creatively and develop practical and soft skills that are highly valued in the workplace. It provides pupils with the opportunity to use creativity and imagination as pupils create products that solve real and relevant problems. Following the literature on the values of D&T, the next section will detail the methodology to identify the values Year 8 pupils attribute to DT and then to see what effect a 'values driven' intervention has on Y8 students' perception of D&T as a valuable subject at GCSE. The methodology will also implement strategies to see if the same reasons identified in the literature are the same reasons which Year 8 give for not studying DT.

Research Methods

Research Questions

The primary question that this study is aiming to address is exploring whether implementing strategies that promote the value of DT increases the uptake at GCSE. Three sub-questions (RQ1 – RQ3 presented on the following page) will help to inform the primary question:

RQ1: Why are students not picking D&T for GCSE?

RQ2: What are the existing values that Y8 students attribute to D&T?

RQ3: What effect does a 'values driven' intervention have on Y8 students' perception of D&T as a valuable subject at GCSE.

Research Design

Educational research is the "application of the principles of a science of behaviour to the problems of teaching and learning with the formal educational framework" (Cohen, Manion & Morrison, 2007, p.48). This lends itself to action research which means the problem was identified (the decrease of pupils selecting DT at GCSE) and measures were implemented to try and resolve the problem (strategies that promote the value of DT). The goal of action research is to transform and improve one's practice. "It is the combination of action and research that has contributed to its attraction to researchers, teachers and the academic and educational community alike" (ibid., p.297). The research can be undertaken by an individual teacher which makes it appropriate in this instance.

Another significant feature of action research which makes it appropriate in this instance is that action research aids the professional development of teachers, and therefore, the research will inform my and potentially others teaching (ibid., p.298). Action research is a cyclical process that involves planning, acting, observing, and then reflecting so it is a systematic learning process. However, the limitations should be noted; the results may not be generalizable and can be prone to problems of observer bias.

The research was carried out with a Year 8 class (24 pupils) studying DT at a mixed, 11-18 comprehensive school in Cambridge. I selected Year 8 as they have not yet selected their GCSE subjects and will be choosing them in Year 9. The specific school and class group was determined by convenience sampling and were selected due to my position as a trainee teacher at the school. The data sources utilised were questionnaires and interviews to collect data from participants. The questionnaires were administered to the 24 Year 8 pupils. The interviews were conducted with myself (as a DT trainee teacher in the same school).

Methodology

This paper believes that the values pupils attribute to DT are intangible, yet whether pupils are going to study DT as GCSE is tangible. While quantitative measures may be used, they are likely only to yield comparatively superficial information about the pupil's plan to study the subject at GCSE. To examine the less overt values attributed to DT at GCSE it is important to combine quantitative and qualitative methodologies for data collection. Action research is informed by data collected from several sources to ensure the validity of information, which is known as triangulation. Therefore, a mixed methodology was used for the empirical data collection, using numerical and verbal data, to gather rich data. A questionnaire approach was used to gain an overall picture, and more in-depth analysis was achieved through group interviews.

Questionnaires

I designed a five-minute questionnaire. Questionnaires were selected as a research method because they offer several advantages over other methods. Questionnaires are a valuable research method in educational research because they offer a cost-effective, efficient, and standardized way to collect data from a large number of respondents on a wide range of topics.

To ensure optimum feedback I anticipated the type of responses that different questions were likely to generate (Cohen, Manion & Morrison, 2007, p.318). Questionnaires, using rating scales were used to catch articulated responses on whether pupils are planning to study the subject at GCSE, and the reasons driving these decisions and will measure, for example, the enjoyment of the subject and whether they believe DT to be a beneficial subject. Yes and no questions were given, with the opportunity to elaborate and unipolar Likert scales will be used to elicit clear quantitative data.

Semi-structured interviews

Semi-structured qualitative interviews for individuals and groups gather data on the more intangible aspects of the values of DT, e.g., values, assumptions, beliefs, and concerns. Interviews were semi-structured, i.e., with a given agenda and open-ended questions. Group interviews will be used to avoid the student participants feeling intimidated as the classroom settings and discussions with the teacher tend to generally be collaborative and not one-on-one. Moreover, a group interview can generate a greater number of responses than individual interviews, as responses may trigger ideas from others.

Sampling

First, the questionnaire was given to all pupils in the class. This is convenience sampling which is popular in educational research (Cohen, Manion & Morrison, 2007). The class was chosen due to ease of access, meaning results are not generalisable, though it should equally be noted generalisability is not the intention of this study (ibid.). The pupils were provided with full explanations of the research intentions and were provided with a real and legitimate opportunity to say no (ibid., p.54). Second, the semi-structured interviews were conducted on a 'critical case' basis, i.e., with participants who have been identified as changing their mind on studying DT after the intervention, or a strong yes or strong no throughout.

Parameters

The data were collected on a 'one-shot' basis rather than longitudinally. The questionnaire was administered prior to the intervention. Interviews were conducted after the intervention. A multi-method approach was used for data collection.

Research Design

An analysis of the data obtained were required to deduce meaning, which will inform the basis of the discussion of the findings. The quantitative data required numerical statistics to be generated into graphs because they can then be depicted visually. The qualitative data yielded from the semi-structured interviews was examined using thematic coding because identify common themes- topics, ideas and patterns of meaning. The interviews were audio recorded on an iPad and transcribed using Otter. Based on the themes identified within the literature, the following themes were reflected on and used as a systematic frame for coding:

- Values attributed to DT
- Reasons for selecting GCSE DT
- Reasons for not selecting GCSE DT
- Careers associated with GCSE DT

Ethics

Having outlined my research proposal at the Faculty of Education, Cambridge, I completed the Faculty's Ethics Form. I then discussed my proposition with my mentor at my placement school. By taking these measures, the study followed the British Educational Research Association's (BERA) (2018, pp.6-37) guidelines. All information regarding to the school and names of the pupils has been anonymised. All mark book data and work are kept securely in accordance to the schools' GDPR policy. Where possible, data has been digitized and kept on password-protected devices, to avoid less secure paper copies being needed.

There are ethical implications of group interviews, as the responses are not anonymous to other participants. However, this was deemed as appropriate as the content of the discussion was not sensitive.

Outline of lessons

The intervention was a series of four lessons centred around the five values of Design and Technology recognised by Hardy (2019). The pupils were able to choose an interior design project, a product design project or an engineering project based on their interests. The lessons covered recognising and creating good design, personal development, economic needs, technological awareness, and generic and transferable skills. No pupils selected the product design project and therefore, details are not outlined below. This could be due to a lack of understanding of the career of Product Design, and if the study was to be conducted again the careers would be explained in more depth.

To give pupils further insight into the values identified by Hardy, the pupils were introduced to three Design professionals: an architect, an engineer, and a product designer. These designers looked at the student's work and selected a winner from each project. An overview of the intervention lessons can be seen below in Appendix 1 and 2.

Findings

Pre-Intervention Questionnaire

Demographicss

A total of 24 pupils responded to the questionnaire. One pupil was absent for the first lesson, but they completed the pre-intervention questionnaire in the second lesson. Table 1 contains a summary of the demographic characteristics of the pupils

Characteristics	Number of participants	N% and mean (SD)	Range
Sex Male Female Other	24 9 13 0	 37.5% 62.5% 0	 N/A
Age (years)	24	12.8 (mean)	1
SEND	4	16.6%	N/A

Table 1: Demographics of pupils participating in study

The first question in the pre-intervention questionnaire was ‘do you want to take GCSE Design and Technology?’ 18.4% (n=4) of pupils answered ‘yes-they wanted to study GCSE D’T. 27.3% (n=6) answered ‘no they did not want to study GCSE DT’. The remainder of pupils 54.5% (n=12) were ‘not sure whether they wanted to study GCSE DT’.

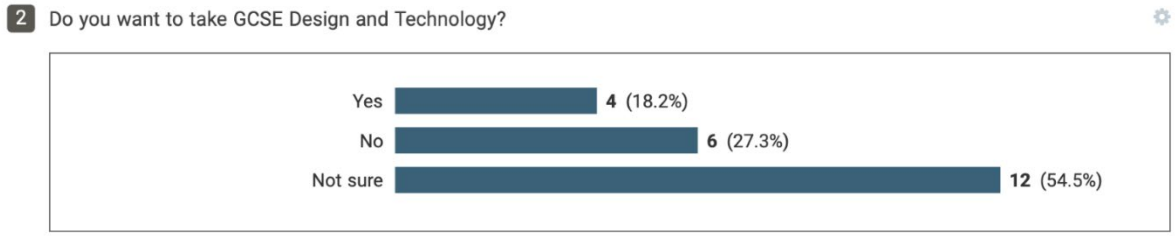

Figure 1: Number of pupils wanting to study GCSE DT

The following question was designed to gauge reasons behind pupils wanting to study GCSE DT, and therefore, was only intended to be answered by 18.4% (n=4) who had answered ‘yes’. However, they were asked to tick all reasons that apply to them, so more than 4 responses were yielded. It is also thought some pupils who answered not sure also stated reasons why they might choose to study the subject. The most stated reasons were ‘it will be a good subject for my future career or university’

which was selected by 75% (n=6) of pupils. 75% (n=6) of pupils selected to gain specific skills I.e. sketching or CAD. 37.5% (n=3) of pupils selected because 'I enjoy it' and one pupil (12.5%) selected 'other'.

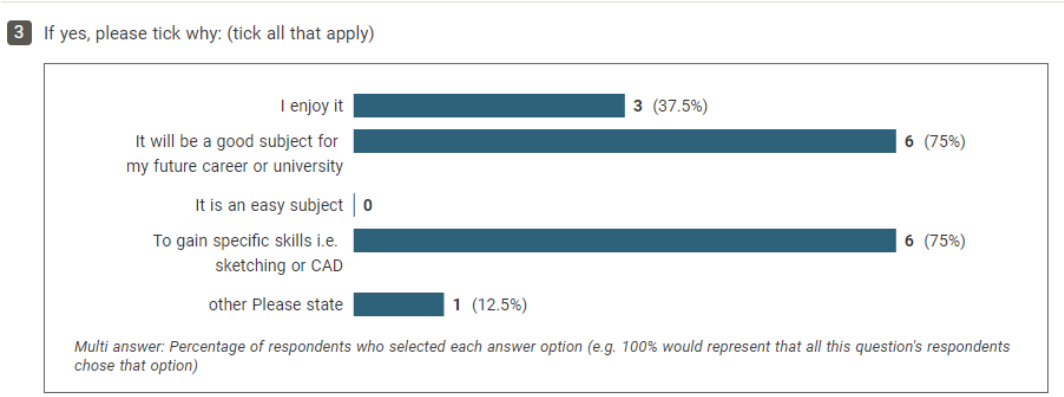

Figure 2: Reasons for pupils opting to study GCSE DT

The next question was designed to gauge why those pupils who selected no or not sure did not want to study GCSE DT. The most popular reason stated was 'it doesn't lead to the future career or university course I want' which was selected by 64.7% of pupils (n=11). 23.5% (n=4) of pupils selected because 'it is not an EBacc subject'. 23.5% (n=4) selected other. 17.6% (n=3) selected 'I do not enjoy it'. One pupil (5.9%) answered 'It is too much work.' No pupils selected 'my parents do not want me to take DT GCSE'.

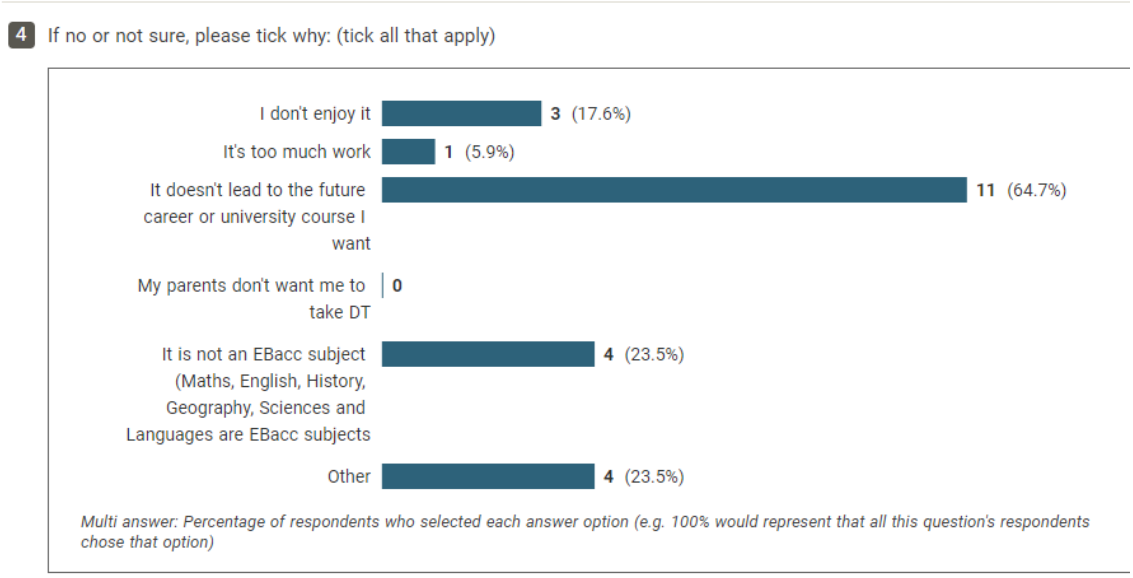

Figure 3: Reasons for pupils not opting to study GCSE DT

Post-Intervention Questionnaire

Again, the same total of 24 pupils responded to the questionnaire. Two pupils were absent for the last lesson where the post-intervention questionnaire was administered, but they completed the questionnaire for homework.

The first question was 'Did you enjoy your careers project?'. The question was a Likert Scale (1- did not enjoy, 5- enjoyed). One pupil (4%) answered 1, so they did not enjoy it. 28% (7) selected 3 so were in the middle in terms of enjoyment. 40% (n=10) selected 4, so mostly enjoyed the careers project and 28% (n=7) selected 5 and enjoyed the project.

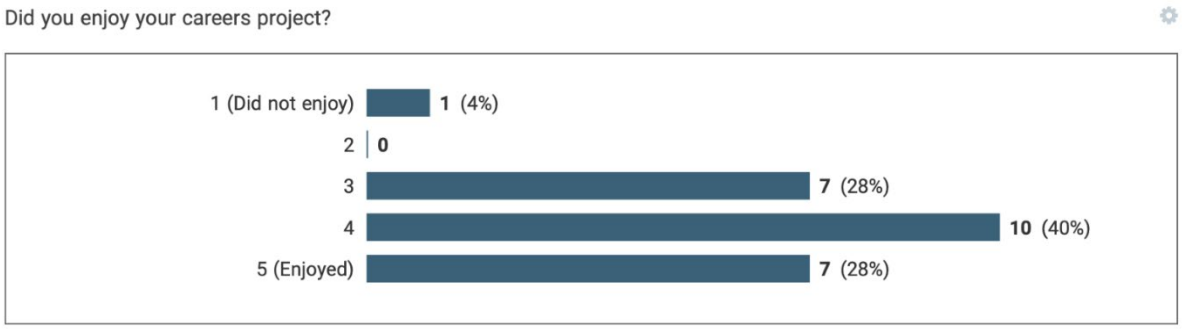

Figure 4: Enjoyment levels of the careers project

The next question was 'do you now want to take GCSE DT?' The number of pupils answering 'yes' had increased from 18.2% (n=4) to 38.1% (n=8). This shows after the intervention there was a 100% increase in the number of pupils wanting to study DT GCSE. There was also a 50% decrease in the number of pupils not wanting to study DT at GCSE. The number of pupils stating 'no' they did not want to study DT GCSE was 27.6% (n=6) before the intervention and this had reduced to 14.3% (n=3). Not sure was still the most common answer with 10 pupils (47.6%) selecting this option.

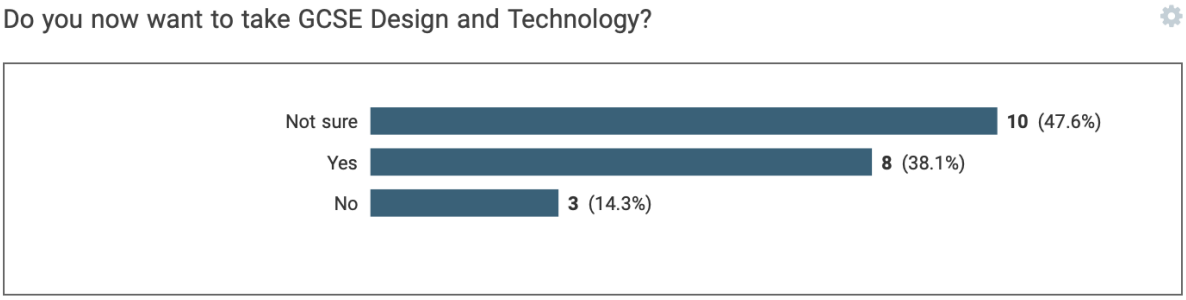

Figure 5: Post intervention - Number of pupils wanting to study GCSE DT

The following question was designed to gauge the reasons for studying DT for those who answered yes. After the intervention, there was a 200% increase in pupils stating they wanted to take DT GCSE as they enjoyed it. Prior to the intervention, 3 pupils (37.5%) selected they would study DT at GCSE because they enjoyed it. After the intervention, 9 pupils (81.8%) selected they would study DT at GCSE because they enjoyed it.

There was a 50% decrease in pupils stating they wanted to take DT GCSE as 'it would be good for their future career or university'. Before the intervention, 75% (n=6) of pupils selected they would study DT GCSE as it would be 'good for my future career or university'. After the intervention 36.4% (n=4) selected they would study DT GCSE as it would be 'good for my future career or university'.

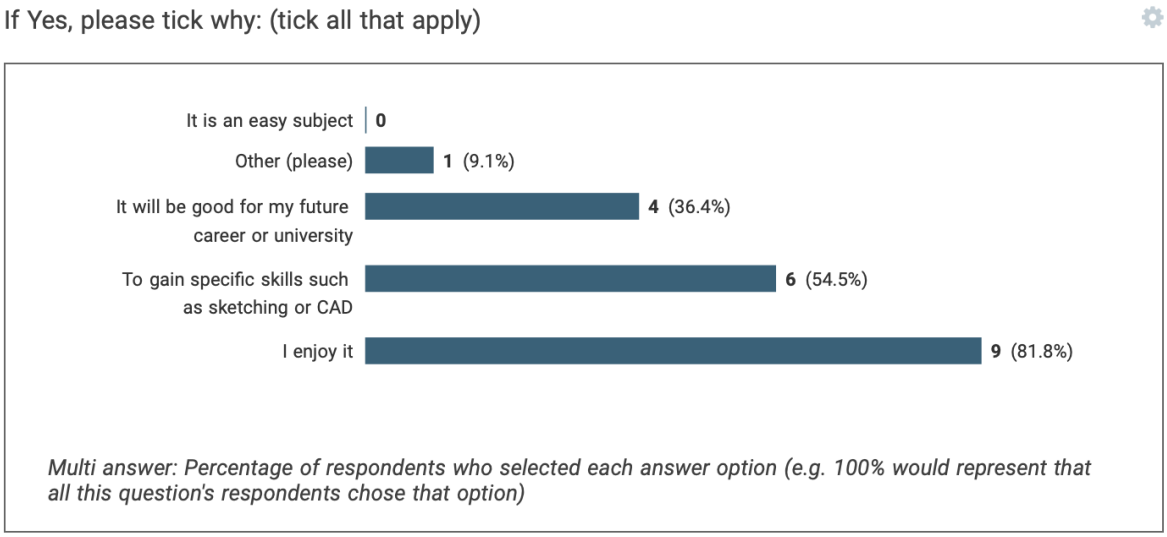

Figure 6: Post intervention - Reasons for pupils opting to study GCSE DT

The following questions were designed to gauge why pupils did not want to study GCSE DT. After the intervention, there was a 33.3% decrease in the number of pupils stating they do not enjoy DT. Prior to the intervention 17.6% (n=3) of pupils selected did not want to study GCSE DT as they did not enjoy it. After the intervention, 14.3% (n=2) of pupils selected they did not want to study GCSE DT as they did not enjoy it.

After the intervention, there was a 27% decrease in the number of pupils stating they do not want to study DT as it does not lead to the future career or degree they want. Before the intervention, 64.7% (n=11) of pupils selected that they did not intend to study GCSE DT as it does not lead to the future career or degree they want. After the intervention, 50% (n=7) selected that they did not intend to study GCSE DT as it does not lead to the future career or degree they want.

After the intervention, there was a 50% decrease in the number of pupils stating they do not want to study DT as it is not an EBacc subject. Before the intervention, 23.5% (n=4) selected they did not want to study DT as it is not an EBacc subject. After the intervention, this had reduced to 14.3% (n=2).

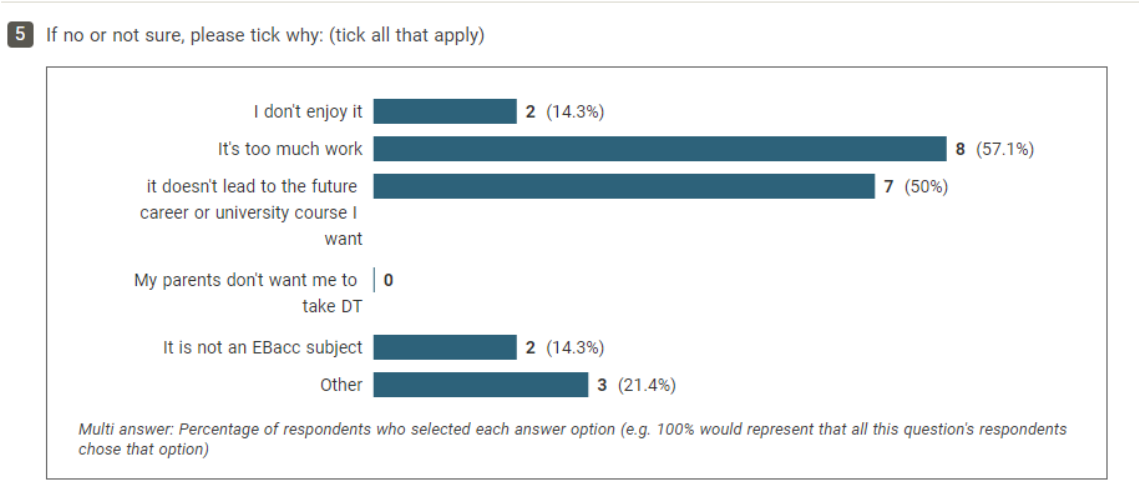

Figure 7: Post intervention - Reasons for pupils not opting to study GCSE DT

Interviews

The interviews conducted were semi-structured and were centred around asking those who wanted to study GCSE DT why they wanted to, asking those who did not want to study GCSE DT why they did not want to study the subject; and then a discussion on the careers DT could lead to and values the pupils attribute to DT.

When asking pupils reasons for wanting to study the subject, several were given. Most stated was, that is a practical subject that can be more engaging than other subjects. For example, pupils stated, "I like making things" and "I like DT because we get to do things and make things rather than just writing." Another reason given was the diverse nature of the subject, with one pupil answering that "I like DT as we get to do lots of different things like cooking, and graphics and then woodwork." Pupils also alluded to the links they recognised between DT and the future careers they wished to pursue with pupils saying ''I want to be a fashion designer so drawing and using varied materials is important for me" and "I want to be an engineer, so DT is important."

In contrast, when asking pupils why they did not want to study the subject, some said the practical nature of DT deterred them, with one pupil stating "I like designing but I don't like making things" and another saying "I like designing and drawing, but prefer Art because then we don't have to make things, I find that bit like the tangram project boring". The diverse nature of DT which encouraged some pupils to study DT also dissuaded others as they said they liked some elements of DT but did not enjoy "cooking or woodwork." Similar to the findings in the questionnaire, the EBacc was also referred to with one pupil stating, "I prefer Art and I can only do one creative subject to do the EBacc" and another alluding to the limited options of GCSE by stating" 'I want to be a doctor, so I have to do Science." Another pupil discussed the lack of creativity in the projects and the focus on craftsmanship stating 'making a puzzle out of wood is boring and old-fashioned, my mum made puzzles at school. I prefer designing on CAD and 3D printing which I have to do at CAD club".

The pupils were asked if the intervention highlighted any new careers that DT could lead to. One pupil answered, "I thought DT was more for things like being a woodworker or metalworker, but there are things I would like such as interior design or fashion design." Another pupil spoke about engineering stating "I didn't know DT would be helpful to become an engineer, I thought it would more need subjects like Maths and Science". Another pupil answered that they were unaware of how many design careers there are- stating "I had never really thought of it before like everything is designed like my phone and TVs and cars and laptops and that takes so many people and makes so much money."

The final question was centred around the values the pupils attributed to DT. Students referred to things such as "learning to make things," and "leading to lots of careers such as engineering." Other things pupils mentioned were that DT is "good for making money for the country and ourselves and could lead to being an entrepreneur because we come up with new ideas". Other values referenced were "being creative and coming up with ideas" and "understanding how things have been designed and made."

Discussion

Research Question 1 - Why are students not picking DT for GCSE?

The literature suggested that a key reason for the decline of DT can be attributed to the views of parents who often see it as a non-academic subject that does not belong alongside subjects such as science, history, and languages. This is a concern because in some schools it has not evolved into a modern subject resulting in significant confusion as to the purpose of the subject. This has not been helped by the fact in some schools' children are making the same things their parents made at school. However, this research does not show that parents' views are influencing pupils' decisions about studying the subject. This is shown by 0% of pupils selecting 'my parents do not want me to study DT at GCSE'. In my experience, working at a top, a super-selective grammar school in London several of the pupils said their parents perceived it to be a 'useless' subject and would only lead to vocational careers 'such as carpentry.' This reflects DT being intrinsically bound to its vocational history and poorly understood by the public.

The literature also indicated that the decline in GCSE uptake may be attributed to that GCSE DT is perceived as less difficult than more traditionally academic GCSEs, such as Maths, English and the sciences, which was shown by the research of Coe (2008). On reflection, a better way to have tested whether this is a factor in the decline of DT was to have included 'DT is too easy' as an option when pupils were selecting reasons why they did not pick DT. However, we can infer that the pupils do not find DT an easy subject from the 0% of pupils who selected they would study GCSE DT because it is 'an easy subject'. Furthermore, after the intervention, 57.1% (n=8) said they did not want to pursue GCSE DT as it was too much work'. Therefore, this research indicates that in this schools, it is not true to say that pupils do not choose to not take GCSE DT because it is too easy.

The next factor the literature referred to as a cause for the decline in DT was the implementation of the EBacc in 2011. Prior to the intervention, 23.5% (n=4) of pupils selected that they did not want to study GCSE DT because it was not an EBacc subject. After the intervention, this had reduced to 14.3% (n=2). This does show that pupils may be aware of the EBacc, and recognise some subjects as more valuable than others. The research did not investigate the effect that the introduction of the EBacc has had on the subject from the perspective of the potential to reduce the amount of time and resources schools devoted to DT. Whilst the research did not investigate the implications of Progress

8, (a value-added performance measure which measures pupils' progress in eight subjects and informs about the progress that pupils in a school make from the end of primary school to the end of year 11) it can be assumed the results may be similar to that of the EBacc. Pupils don't seem to be aware of Progress 8, however, it is important to schools in terms of resources and finances, and they may structure option blocks or encourage pupils to choose subjects based on Progress 8.

The research did not investigate the suggestion in the literature that some schools may not have the resources or funding to offer a comprehensive DT curriculum, which may impact pupils' interest in the subject. This is because the pupils were all from the same state-comprehensive school, and therefore, it would be difficult for them to know what DT would be like in a different school with more resources. Furthermore, the school is well equipped with a laser cutter, several 3D printers and an IT suite, which enables them to produce creative projects.

A key issue addressed in the literature was that pupils do not utilise creativity and explore design, but rather, craftmanship, which may detract from their enjoyment of the subject, or lead to perceptions DT is just for carpentry. Nicholl and McLellan (2008) found that project outcomes were very similar and predetermined by the teacher. The emphasis of the projects were based on acquisition of practical craft-based skills, which limits pupil's opportunities to be creative. However, creativity was deemed too intangible to be addressed in the questionnaire, and therefore, was addressed in the interviews. Pupils referred to enjoying designing but not enjoying the making and referred to projects such as the Tangram project which is making a wooden box and puzzle as 'boring', which, given the findings of Nicholl and McLellan (ibid.), could be attributed to the lack of creativity in the project.

Prior to the intervention, the most common reason stated for not wanting to study DT was that "it does not lead to the university course or career I want to do". Of course, there are many careers for which other subjects are much more valuable, for example for those who want to study Medicine, Science and Maths are vital. However, the pupils were unaware of the careers that DT could lead to, as after the intervention there was a 27% decrease in the number of pupils stating they do not want to study DT as it does not lead to a future career or degree they want. This was reaffirmed by the results of the interviews where pupils made statements such as "I thought DT was more for things like being a woodworker or metalworker, but there are things I would like such as interior design or fashion design." Another pupil spoke about engineering stating, "I didn't know DT would be helpful to become an engineer, I thought it would more need subjects like Maths and Science."

Overall, similar to the outcome of the literature review, the research indicates that there is a wealth of reasons why students are not picking DT GCSE. The key issues are the perceived value of its curriculum due to the lack of creativity and emphasis on making similar projects to what pupils' parents made. We cannot ignore the inadvertent impact of education policy reforms, including school accountability measures; however, the decline predated these changes, so they are not the sole cause.

Research Question 2 - What are the existing values that Y8 students attribute to DT'?

Prior to the intervention, pupils who wished to study DT GCSE were asked why they wanted to study the subject. 75% (n=6) of pupils stated that it led to the 'future career or degree they wanted'. This links to the value that Hardy (2019) identified as individual's and society's economic and domestic needs. Hardy's research into the values of DT showed that many people value the everyday life skills taught in DT as well as learning skills to use in future DT-related jobs.

Also, prior to the intervention, 75% (n=6) of pupils stated they wanted to study GCSE DT to gain specific skills such as sketching or CAD. These skills link to the value identified by Hardy (ibid.)- technological awareness. Technology has become a huge part of our daily lives and Hardy explains that allows pupils to have a critical understanding of the impact of products on society. In the interviews, pupils spoke about how they thought CAD skills would help them to stand out and would be good for their future careers. This also linked to enjoyment with several of the pupils interviewed saying Tinker Cad and 3D printing had been their favourite thing they had done in DT.

Regarding enjoyment, there was a 200% increase in the number of pupils stating that they enjoyed DT as a reason for choosing to study the subject at GCSE. Enjoyment can be linked to the value of personal development which was recognised by Hardy. This is where pupils develop soft skills such as teamwork, communication, and leadership. They also increase confidence, resilience, and self-efficacy. If pupils are aware of their development, it can be assumed they would enjoy the subject. This was then discussed in the interviews where pupils discussed their own personal development. Pupils referred to developing in areas such as problem-solving and empathy because they needed to think about the needs of the client.

The central value of DT recognised by Hardy (2019) was creating and recognising good design. As part of the project pupils looked at existing designs and evaluated them. In the interviews, pupils were more aware of designers and engineers from their research and were also able to discuss other

designers that we had not looked at in the project. Whilst none of the pupils mentioned creating or recognising good design when asked ‘what is important about DT?’ they were able to discuss in depth the importance of creating and recognising good design, and when asked if they thought this was valuable, they all answered yes.

From a pupil's perspective the central values they attribute to DT are leading to future careers and degrees, and gaining specific skills they find desirable, which we can infer will also be to help them to develop to reach and be successful in these careers. Most pupils interviewed had a clear career path in mind, and whilst of course, this may change, they were aware of the steps needed to achieve these goals.

Research Question 3 - ‘What effect does a 'values driven' intervention have on Y8 students’ perception of D&T as a valuable subject at GCSE’

The final research question was investigating if the ‘values driven’ intervention had an impact on the pupils’ intention to study DT at GCSE. After the intervention, there was a 100% increase in the number of pupils wanting to study DT GCSE, with 38.1% (n=8) answering yes, they would choose GCSE DT. This shows that the values-driven intervention was successful in increasing the number of students wanting to study GCSE DT.

The enjoyment levels ranged from 3-5, with one pupil stating 1, which is a good indication they enjoyed the project and why pupils might now consider taking GCSE DT. The literature found that students generally enjoyed DT but had concerns regarding its value. This was therefore discussed in the interviews. Pupils spoke about why the values-driven intervention had changed their opinion of studying DT at GCSE. One pupil spoke about how the interior project did not require them to make anything, but how they enjoyed producing a cardboard prototype to communicate her design idea and she had not thought a designer did not have to fit the kitchen but produce the idea. Another pupil spoke about how they enjoyed working on a design brief and interpreting this themselves rather than being told what to make. Pupils also spoke about how it widened their views on the careers that DT could lead to stating “I thought DT was more for things like being a woodworker or metalworker, but there are things I would like such as interior design or fashion design.” This agrees with the literature that more needs to be done to emphasise the importance of DT leading to future careers.

Some of the pupils interviewed did not wish to study GCSE DT after the values-driven intervention although they said they really enjoyed it they stated reasons such as "I prefer Art and I can only do one creative subject to do the EBacc" and another alluding to the limited options of GCSE by stating" 'I want to be a doctor, so I have to do Science."

Conclusion

From the research, it is evident DT is a misunderstood subject, due to its vocational history and the implementation of the EBacc, DT has been perceived to be lower in status than other subjects such as Maths and Physics. One issue discovered through the action research project is that the amalgamation of several individual subject disciplines, such as woodwork, food technology, metalwork, and design has resulted in Design and Technology having a confused identity. Referring to 'What values do year 8 pupils attribute to DT' pupils recognised that they had developed problem-solving and communication through studying Design and Technology. Many students also recognised how DT could prepare them for their future, by equipping them with skills that are valuable for future careers. The way in which pupils valued DT appeared to change after the intervention, with more pupils stating they would study GCSE DT despite it not being an EBacc subject and more pupils stating they enjoyed DT during the interviews. Whilst the results cannot be generalised, the intervention was successful at increasing the number of pupils who wished to study GCSE DT by 100% and there was also a 50% decrease in the number of pupils stating they would not study GCSE DT.

Implications for teaching

This study suggests that a 'values-driven intervention' at Key Stage 3 encourages more pupils to study GCSE DT. Based on the findings, practitioners of DT may wish to consider the following:

DT projects that aren't solely 'making' projects will help to encourage more students to study GCSE DT. Having projects that have relevance to society such as by addressing pressing concerns such as poverty alleviation and sustainable development in emerging nations can help parents and pupils see the importance of the subject.

DT can lead to a wide range of careers, that many pupils are not aware of. It could be beneficial to link projects in the classroom to future careers or discuss these careers in lessons. DT can lead to

careers in a wide variety of industries such as fashion, engineering, architecture, information technology, careers in hospitality, and even education. It is important pupils get an insight into these careers.

Next steps

The next steps are for me to implement project-based learning and emphasise the values of DT in my own lessons. It may be beneficial for values-driven interventions to be tested in a wider range of schools to assess if the impact is generalizable.

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Appendix 1

Engineering Lessons Overview

Engineering Lessons:	
Lesson 1:	Pre-intervention questionnaire Research three types of bridges- Beam or truss Bridge , Arch Bridge, Suspension Bridge, research why triangles are good for bridges, Maths Challenge strength to wait ratio
Lesson 2:	Construct a free-standing bridge out of spaghetti, strong enough to support a bag of sugar.
Lesson 3:	Construct a cardboard boat able to hold 250g of sugar.
Lesson 4:	Research Geodesic domes and construct a bike crash helmet out of jelly sweets and cocktail sticks. Post intervention questionnaire

Appendix 2

Interior Design Lessons Overview

Interior Design Lessons:	
Lesson 1:	Watch a video on the Frankfurt kitchen, carry out evaluation re. function, aesthetics, ergonomics. Mood board on the kitchen.
Lesson 2:	Create a floorplan layout for the kitchen. Draw over elements of kitchens to create a final design on your iPad.
Lesson 3:	Create final design using Ikea kitchen builder CAD software.
Lesson 4:	Create a card model of your kitchen.