What are design and technology teachers doing in response to a subject change?

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Thesis Abstract

In 2014, the secondary subject, design and technology, went through a fundamental policy reform that impacted teachers and their work. Previous research into teachers and subject change in secondary design and technology highlighted the challenge of subject change to established ways of working and the problems associated with teachers' perceptions of practice. However, these studies focused on a different iteration of the subject and teacher experience, exposing a gap in empirical research about the current iteration of the subject and teacher experience. Therefore, this research aimed to investigate the factors influencing design and technology teachers' capacity to translate policy into practice.

A qualitative study explored 12 teachers' day-to-day experiences of subject change through semi-structured interviews. Data were collected from the secondary design and technology teachers during the academic year 2018 - 2019. Interview transcripts were individually interpreted as visual teacher profiles and then coded for thematic analysis using NVivo. A set of themes described the different accounts of experience including: *subject traditions, subject coherence, sharing expertise, teacher sub-culture, subject language, and subject teaching.*

My research suggests that the key factor that influenced the translation of policy into practice for these teachers was the level of opportunity or risk associated with embedding new traditions within existing practice. My research also suggests that for these teachers, the opportunities related to ongoing professional development within a trusted community of

teachers supported their capacity to make positive responses to change. Access to professional development opportunities, both formal and informal, created the space for these teachers to align their individual values with the collective aims of the policy development. Future research should investigate the barriers to subject team dialogue and develop initial teacher education (ITE) programs that emphasise the importance of developing theoretical and practical knowledge and skills associated with teaching both in and outside a specialism.

List of abbreviations

AC	Academy Chain (School Type)
BSF	Building Schools for the Future
CDT	Craft, Design and Technology
DfE	Department for Education
DES	Department of Education and Science and the Welsh Office
DfEE	Department for Education and Employment
D&T	Design and technology
DTassoc.	Design and Technology Association - The subject association represents and supports its members who are primarily D&T teachers
EBacc	English Baccalaureate (sciences, computer science, geography, history and languages)
FS	Faith School (School Type)
FE	Further Education
GCSE	General Certificate in Secondary Education
HMSO	Her Majesty's Stationary Office
HoD	Head of Department

ITE	Initial Teacher Education
KS1	Key Stage 1 (KS1) - Primary education covering school years 1 – 3 (5 – 8 year olds)
KS2	Key Stage 2 (KS2) - Primary education covering years 4 – 6 (8 - 11 year olds)
KS3	Key Stage 3 (KS3) - Secondary education, usually covering the non-examination years 7 – 9 (11 - 14 year olds)
KS4	Key Stage 4 (KS4) – Secondary education, usually covering the GCSE years 10 – 11 (14 - 16 year olds)
LA	Local Authority (School Type)
MAT	Multi-Academy Trust
NEA	Non-examined Assessments (DfE 2016)
NPQSL	National Professional Qualification for Senior Leadership
NVivo	A qualitative data analysis software package
Ofsted	The Office for Standards in Education
OTP	Outstanding Teacher Program
PGCE	Postgraduate Certificate in Education
Product Design	Another name for RM – Resistant Materials

Progress 8	DfE measure based on students' progress measured across eight subjects consisting of the English Baccalaureate subjects and three further subjects (including design and technology)
QCA	Qualifications and Curriculum Authority
QTS	Qualified Teacher Status
RM	Resistant Materials
SAT	Specialist Academies Trust
SEND	Special Educational Needs and Disability
SKE	Subject Knowledge Enhancement (course)
SLT	Senior Leadership Team
SSM	Soft Systems Methodology
STEM	Science, Technology, Engineering and Mathematics
TLR	Teaching and Learning Responsibility

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Chapter 1 Introduction

This chapter contextualises the research project by outlining the rationale and focus of the study. In this chapter, the study's parameters are established, and key terminology is explained. The chapter provides a framework for the thesis and outlines to the reader how the study aim and research questions will be addressed in the thesis.

1.1 Background of the study

What does it mean to be a teacher? I like to muse on Shulman's (1986) definition that to be a teacher is by default the highest award within the academy, this is because the university award of 'master' or 'doctor' means 'teacher'. To me, this means that when a scholar is at the top of their subject (professional field) they are then in a position to teach. Shulman used this definition of a teacher during his presidential address at the 1985 annual meeting of the American Educational Research Association. He used the speech to advocate for a better understanding of a teacher's knowledge. Shulman emphasised the mismatch between the idea of teachers as 'masters' of their subject and the reality of a teacher's work and professionalism, which at the time was being undermined by government interference. A situation that, despite the gap of nearly 40 years resonates for teachers working in England today. Today teachers find their subject mastery questioned or ignored by governmental drivers that impose changes to their work. Changes that can breed insecurities about the level of change required and the types of knowledge and expertise a teacher may need to develop as a consequence (Ball 2017).

However, being a master of the knowledge one is responsible for is important and teaching that knowledge matters. Specific to design and technology, the idea that teachers and teaching are essential becomes prescient when pupil's capacity to act in 'designerly' ways is reliant on their teachers' knowledge of design and technology (Stables 2008, p. 8). Ways that help learners to imagine, and determine future realities. This leads me to ask: what it means for design and technology teachers working in the context of change? How do design and technology teachers make sense of the insecurities that change brings? And what do they believe about their role in terms of developing pupils' designerly knowledge and pedagogy?

Design and technology teachers are expected to interpret curriculum into practices that develop subject knowledge and skills. Teachers have both knowledge of a subject and an understanding of the best way to teach it; however, their professionalism is often questioned through the persistent control of teachers' work and the curriculum through government intervention (Department for Education 2013, 2015b). These factors can undermine the unique quality of knowing and teaching that make the job of teaching and therefore, a teacher's role, special (Buchanan 2015). Government intervention has impacted the subject's history, which in turn has made it difficult to embed a common ideology, despite a 30-year history of design and technology in the curriculum (Layton 1994). This leads me to questions about how design and technology teachers align future subject ideologies with those of the past? How do they cope with government intervention? As well as how do they interpret policy

intervention relating to new teaching methods and curriculum?

The general purpose of this study was to investigate the qualitative ways that design and technology teachers were translating policy into practice during a curriculum reform. By investigating the different ways that the teachers experience, understand, and practice the subsequent changes knowledge can be developed to shed light on the ‘active contribution’ (Priestley, Biesta and Robinson 2015, p. 1) a teacher makes towards managing the change process (Fullan 2015).

1.2 Key terms

This study provides definitions to explain the operational terms for design and technology, design and technology teachers, and initial teacher education.

1.2.1 Design and technology

This study is concerned with the teaching of secondary design and technology within the English National Curriculum. Specifically, the published programs of study for teaching Key Stage 3 (KS3: 11 - 14 year olds) from September 2014 (Department for Education 2013); and the General Certificate of Secondary Education (GCSE) for teaching to KS4 (14 - 16 year olds) from September 2017 (Department for Education 2015b).

1.2.2 Design and technology teachers

The study is concerned with design and technology teachers that work in

secondary education and have qualified teacher status (QTS) and an academic qualification that prepares them to teach the subject to 11-16 year olds. Design and technology teachers qualify to teach the subject through an undergraduate degree or post-graduate qualification. For design and technology teachers that study through a post-graduate route, an additional first-degree is required. The types of first-degree that student teachers possess include variations on engineering, architecture, product design, fashion design, textile design, graphic design, and food science. These diverse qualifications all share the characteristic of being categorised as ‘applied knowledge territories’ within higher education (Bell 2015).

1.2.3 Initial teacher education

This study discusses initial teacher education (ITE) and specifically the course delivered at one (the researcher’s) university. The course, like other teacher preparation courses in England is subject to Ofsted inspections and benchmarks course content against Department for Education (DfE) requirements (Department for Education 2011). Specific to design and technology, ITE courses are also benchmarked against a set of minimum subject knowledge competencies for trainee teachers that recommend student teachers to become proficient in two material specialisms (Design and Technology Association 2010). These competencies have been used to direct course design and measure trainee teacher knowledge and skills by all those involved with ITE since 1995, including a revision in 2010 and a replacement - The Career Profile

for Teachers of Design and Technology: Subject Competencies (Design and Technology Association 2017).

1.3 My personal context and motivation

I decided to undertake this study about teachers of design and technology as a direct consequence of my role in initial teacher education (ITE), which I began in 2007. A role that was part of a twenty-year interest in teachers and teaching that started when I became an Advanced Skills Teacher (AST) for the local education authority. Working as an AST helped me to look beyond my teaching classroom and consider the different ways that other teachers approached their work. This experience led to opportunities that included the facilitation of cross-school textile teacher network, one-to-one teacher professional development, and subsequent promotion to teaching ITE at a local university.

At the university, I lead the secondary design and technology postgraduate certificate (PGCE) modules, alongside other teacher education modules. Since joining the university in 2007, I have witnessed the growth and subsequent decline of student numbers in design and technology teacher education. When I entered ITE, it was a period of growth for the subject area. Developments came in the form of two Ofsted subject reports (Ofsted 2008, 2011) that published data on the subject and recommended improvements to teaching. These recommendations led to two funding opportunities to resource an ITE food technology strand within the university, and a Digital Design and Technology program of professional development (The National Archives 2011). The centre

promoted the teaching of advanced aspects of design and technology, including: electronics, systems and control, and computer-aided design/manufacture (CAD/CAM) to ITE university students and local teachers. Working on the Digital Design and Technology program of professional development started my interest in the teaching of electronics through textile oriented projects. To contextualise my own position on the teaching of design and technology it is useful to reflect that I came to ITE with a first-degree in Knitwear Design and several years of experience in industry. I completed my ITE as a mature student and during that time I trained to teach both textiles and food technology – meeting the Design and Technology Association (DTassoc.) subject minimum competencies. I was encouraged to develop some academic knowledge of teaching Resistant Materials (RM), however, my placement experience did not afford practical opportunities to apply my learning. During a ten year career working in secondary schools, I mainly taught textiles technology and food, alongside brief periods teaching child development, RM and art and design.

My move to university teaching provided the opportunity to work with a smaller team of colleagues and develop my expertise beyond textiles and food. The subsequent involvement in the Digital Design and Technology program of professional development provided opportunities to complete small scale research projects focused on curriculum development across electronic-textiles and sustainability (Davies and Hardy 2016, Davies and Hail 2015, Davies and Rutland 2013). Since completing my masters, the university has seen a reduction in ITE student numbers with the closure of

undergraduate routes into secondary teaching for design and technology. The resulting closures led to an end to specialist design and technology teaching facilities within the university and external changes to ITE, curriculum, and support for curriculum projects. This had potential consequences for the student teachers that I work with as opportunities for professional development and networking through the university that had benefited me over the years, might be lost.

This was the driver in my decision to undertake a professional doctorate in education and the subsequent development of my research questions.

1.4 Political context

In 2010 a new Coalition Government introduced plans for significant reforms in education. The publication of the document - The Importance of Teaching: The Schools White Paper (Department for Education 2010) set out proposals for reforms to address perceived weaknesses with the current education system. Weaknesses that the report proposed to address through new approaches to teacher education, curriculum, assessment, qualifications, and school systems. Amongst other things, this meant that teachers would need additional training to teach the new design and technology curriculum, and teacher education providers would need to adapt course content to the new reforms. In addition, the review proposed giving teachers greater professional freedom over how they organise and teach the curriculum and to ensure that the content compared favourably with other high performing curricula internationally. For design and technology, this meant a greater emphasis on the

technical knowledge of the subject and less emphasis on the practical knowledge (Department for Education 2013, 2015b). The policy also introduced a single subject GCSE, at KS4 that increased the weighting of the examination element to equal that of coursework (now called the non-exam assessment (NEA)).

The published curriculum covered Key Stages 1 – 3 (Department for Education 2013) and led to the new GCSE and technical certificate pathways at KS4 (14 – 16 year olds). The GCSE design and technology curriculum was published in 2015 for first teaching in September 2017 (Department for Education 2015b). Secondary teachers were expected to embed the KS3 curriculum from September 2014 onwards (Choulerton 2016) to prepare pupils for the first teaching of design and technology GCSE in 2017. In addition, the GCSE removed food technology from KS4 design and technology and created a separate GCSE examination called Food Preparation and Nutrition (Department for Education 2015c).

The way that schools reported attainment at the end of KS4 changed with the introduction of the English Baccalaureate (EBacc) and Progress 8 (Department for Education 2020). Progress 8 was introduced in 2014 as a DfE measure to monitor attainment across eight subjects. Schools became accountable for pupils' progress across eight subjects:

- maths (double weighted) and English (double weighted, if both English language and English literature are sat);
- three qualifications that count in the English Baccalaureate (EBacc) measures;

- three further qualifications that can be GCSE qualifications (including EBacc subjects) or technical awards from the DfE approved list (Department for Education 2020, p. 12).

The measurement of GCSE design and technology related to ‘three further qualifications’. These qualifications were optional and separate to the EBacc subjects, below:

- English language and literature;
- maths;
- the sciences;
- geography or history;
- a language (Department for Education 2017).

The technical awards referred to in this measure, include BTEC and level 1 and 2 courses in Construction and the Built Environment and Engineering (Department for Education 2015a). However, the new technical awards, that some examination boards proposed to replace the withdrawn GCSE endorsed titles, including textiles technology (AQA 2016) have not appeared on the approved list of qualifications.

Previous ITE provision at my university included undergraduate and postgraduate routes into teaching design and technology. Undergraduate courses in teaching involved taught modules and placement experiences that covered three material specialisms and electronic systems. Postgraduate routes involved taught modules and placement experiences in two of the four material specialisms - resistant materials (RM), food,

textiles and electronic systems. Since 2017, undergraduate courses have been closed down, and postgraduate routes expanded to include university and school-based pathways. Postgraduate courses include modules that focus on single-subject design and technology and placement experiences that encourage the same approach but are not guaranteed. To support the mixed placement experiences afforded through the practical element of the postgraduate route, my university has offered DfE funded subject knowledge enhancement (SKE) courses to all trainees pre-PGCE start date (Department for Education 2021).

The DfE ended funding opportunities for design and technology (subject specific) professional development in 2012. However, a colleague and I secured funding to deliver professional development to local teachers between the academic years 2014 and 2015 from the University European Regional Development Fund and Local Innovation Collaborative Fund (LINC).

1.5 Research aims and research questions

The project's general aim was to generate knowledge about the qualitatively different ways in which teachers, who completed their ITE with one university provider, responded to and implemented the subject policy changes introduced in 2014. I wanted to develop knowledge about the different ways that these teachers constructed meaning and actions about policy reforms to support my student teachers, whilst on university-based teacher preparation courses. Therefore, the main research objective was:

- to investigate the qualitatively different ways design and technology teachers translate policy development into practice.

To meet this objective I designed a project to answer the following research questions:

- what are the specific issues and challenges that design and technology teachers face when translating policy development into practice?
- what professional experiences influence different teacher responses to the challenges a policy development brings to established practice, focusing on teacher agency?

1.6 The significance of the study

Knowing how teachers manage a subject change in design and technology will provide knowledge about the processes teachers use. Processes that are key to enabling successful educational change. Fullan (2015) recognises the sense of loss brought about by a change and the importance of aligning individual values to those of the change driver, which he recognises as potentially conflicting. A better understanding of how design and technology teachers manage the clashes between their individual needs and those imposed by curriculum policy will shed light on ways to progress with subject improvement. School improvements that will potentially raise pupil outcomes and contribute to developing pupils' technological knowledge (beyond a practical focus) will legitimise the subject within the National Curriculum (Miller and McGimpsey 2011, Bell,

et al. 2017). Not managing the changes may lead to a potential lack of improvement in the subject, which delegitimises the subject within the curriculum (Choulerton 2015a, 2015b, 2016). As exemplified by the non-inclusion of design and technology in the EBacc. Therefore, this project can illuminate how teachers interpret policy into practices that potentially improve schooling (and therefore, pupil outcomes) and develop better knowledge for supporting the training of teachers in school improvement within the prevailing ideology.

1.7 COVID-19

The project data was collected before the global pandemic of 2020 - 2022.

1.8 Research project parameters

The parameters applied in this project were determined by a wish to understand the different ways that secondary design and technology teachers working in England responded to a subject change concerning the personal and political contexts introduced above. This affected the study's parameters in two ways: it was located in England, and the participants all worked in state-funded English secondary schools. In addition, they completed their initial teacher education (ITE) at one university. ITE is taught in other universities and other types of provision. It is beyond the scope of this study to incorporate design and technology teachers' responses to subject change studying with other universities. However, it would be worthwhile in the future to compare the findings from this study with similar groups that completed their ITE with other university

(and school-based) providers.

A second limitation focused on the teachers' experiences during the first teaching of the new KS4 design and technology examination. The teachers interviewed had not taught a complete iteration of the course. Therefore, the teachers' interview questions focussed on the subject change within KS3 and KS4 design and technology, to ascertain the resources used by teachers in the period leading to the first GCSE examination (Department for Education 2015b).

1.9 Assumptions

This project included the following assumptions:

- the participants gave their true perceptions of the internal and external experiences they attributed to subject change at the time;
- the participants understood the concept of design and technology as a school subject;
- the following descriptions and interpretation of the generated data accurately reflected the perceived experiences of the participants.

1.10 Thesis Outline

This thesis is presented in seven chapters, including this one.

Chapter 2 first reviews the literature to define the concept of agency and the importance of teacher agency in the process of change. Second, literature is used to analyse the history of design and technology teachers and teaching, and the different ways that design and technology teachers

have translated subject policy into past practice. Finally, the recent policy development is examined and issues that might arise are identified. This chapter reveals the limited research into the issues and problems that design and technology teachers face and the different ways they deal with the specific challenges that this subject develop.

Chapter 3 explains and justifies the approaches and methods used to answer the three research questions of the study. The research design involved six stages that drew on a phenomenographical approach (Marton 1981). Stage 1 involved the selection of 12 design and technology teachers, followed by stage 2, which designed and piloted the interview protocol. Stage 3 collected data through semi-structured interviews, and stage 4 transcribed the interviews and generated a series of individual teacher profiles. Stage 5 sorted the responses in the transcripts in terms of focus and frame of reference. Finally, stage 6 compared the commonality and diversity of themes and considered the relationship between groupings to formulate a set of categories. This chapter describes a new method of visual analysis developed by the author to interpret the design and technology teacher interviews, which is applied in the next chapter.

Chapter 4 describes the teachers' accounts of subject change and uses the visual analysis method developed in Chapter 3 to draw out the salient factors for each teacher. This chapter contributes a set of individual profiles that describe each teachers' experience of subject change.

Chapter 5 first captures the divergent experiences and strategies that the

teachers employed to deal with subject change through the thematic analysis. Secondly, the themes are categorised hierarchically to describe a limited set of responses to subject change. This chapter provides a set of themes and categories that can be used to explain the processes use by design and technology teachers during a policy subject reform.

Chapter 6 uses the lens of teacher agency to analyse the individual teacher profiles, thematic analysis and categorisation. The chapter is divided into three sections. The first section discusses the different ways that the data shows how teachers drew on their past (iterational) experiences of teaching the subject to influence new habits in the present. The second section discusses how the data demonstrates these teachers imagined future (projective) experiences of teaching the subject to influence risk-taking in the present. The third section discusses how the data showed the teachers problematisation of subject change in the present (practical-evaluative). This chapter shows the relationship between design and technology teachers' ability to translate policy into practice and the teachers' opportunities to test and reflect on practice with others.

Chapter 7 summarises how the study aims were met. Investigation of the teachers' experiences of the change process and analysis against the three dimensions of teacher agency contributed to knowledge about the different ways that individual and departmental factors influence design and technology teachers translation of policy into practice. The thesis contributes new knowledge about the issues and problems that teachers

face and the different ways they deal with the challenge of subject change across a range of contexts. The resulting toolkit contributes to future conversations about teachers, subject change, and improvements to internal and external ITE provision for secondary design and technology education.

This study provides a set of individual design and technology teacher profiles, a range of subject change themes and categorises of description to refute Miller and McGimpsey's (2011) accusation that teachers are what is wrong with the success of the subject. Second, the study enhances knowledge and understanding about subject teaching and teachers in design and technology to respond to Jones, Bunting and de Vries (2013) observation that we have little knowledge and understanding of the teachers that shape the subject. Finally, the individual design and technology teacher profiles and a thematic analysis of the collective data themes presented in chapter 5 can be used for further research to understand (and influence if necessary) the individual and departmental factors that impact design and technology teachers and their work.

As a starting point, a review of the available literature on the concept of agency and the history of policy development will progress the study's conceptual framework.

Chapter 2 Literature Review

This chapter reviews research in the field, provides further context to the project and identifies gaps in the literature. The chapter is divided into three sections. First, literature is used to explore the concept of agency and its importance within education and the work of teachers. Next, the design and technology literature is reviewed to show key moves in the history of design and technology teachers and teaching, and then how teachers have translated subject policy into practice in other contexts and countries up to the most recent change. Finally, professional and scholarly literatures about the recent policy development and context are reviewed to outline the specific ways that the new policy differs from that of previous iterations, and the potential challenges this will lead to for teachers. This chapter identifies the gaps in knowledge about a teacher's work and factors that influence teachers' capacity to translate policy into practice. The chapter contributes to the development of answers to the research questions:

- what are the specific issues and challenges that design and technology teachers face when translating policy development into practice?
- what professional experiences influence different teacher responses to the challenges a policy development brings to established practice, focusing on teacher agency?

2.1 Defining the concept of agency and teacher agency

A teacher's work can be conceptualised as human behaviour within the

social world (Emirbayer and Mische 1998, Priestley, Biesta and Robinson 2015). For example, a teacher plans to teach a unit on electronic-textiles when the new GCSE policy includes content on the teaching of modern technologies (Department for Education 2013). This intended action of teaching has the capacity to promote an aspect of the subject change. However, this simplifies the action of teaching into a set of behaviours. Therefore, we need to think about subject change in relation to what led the teacher to act in this way and what role the GCSE policy played in that intended action. To conceptualise human behaviour the study draws on Giddens definition of the 'agent' and 'agency' within his theory of structuration (Giddens 1984, p. 3). Building on Comte and Lévi-Strauss, Giddens defines human behaviour as a set of intentional actions that an actor takes to produce an outcome. The actions the human takes are motivated by some external need or desire that is rationalised through reflections on what the human actor already knows or believes to be the right action. Therefore, to be human:

> is to be a purposive agent, who both has reasons for his or her activities and is able if asked to elaborate discursively upon those reasons (including lying about them) (Giddens 1984, p. 3).

However, the actions of agents have consequences that influence the motivations and reasoning that surround an agent's actions, see Figure 1. This then leads to debates around the issue of developing social knowledge through the study of structure or agency (Giddens 1984, Archer 1996). For the purposes of this study, I am interested in investigating teachers actions with a focus on agency (Archer 1996,

Eteläpelto, et al. 2013, , Pantić 2015, Priestley 2015, Priestley, Biesta and Robinson 2015, Sherman and Teemant 2021) . Whilst doing this I need to remain mindful that the opportunities afforded by a teacher's situation (social world) are likely to impact a teacher's 'reflexive monitoring of action' (Giddens 1984, p. 5).

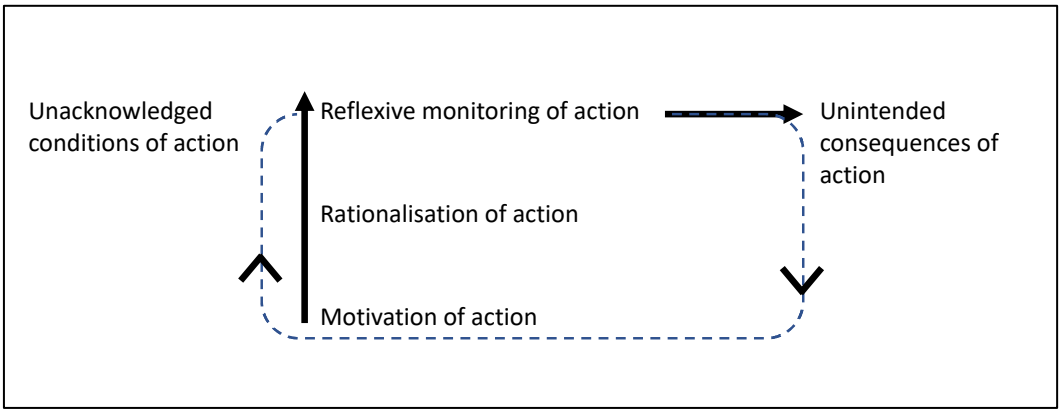

Figure 1: A diagram of Giddens' (1984, p. 5) model of the agent.

To gain a better understanding of the theory of agency, I have drawn on the work of Emirbayer and Mische (1998). In the article 'What is Agency?' they develop a theory of agency that breaks down the different ways that agency can be applied to human behaviour. One of the ways they do this is to define agency as temporal – being informed by the past but orientated toward the future and present – and that the structural contexts of action are also situated across multiple fields of time – being informed by different social situations in which action happens. To break this down, I will use the words of Emirbayer and Mische to illustrate their view that:

> the temporally constructed engagement by actors of different structural environments—the temporal – relational contexts of action—which, through the interplay of habit, imagination, and

> judgment, both reproduces and transforms those structures in interactive response to the problems posed by changing historical situations (1998, p. 970).

In arguing that agency is complex they recognise that agency might change from one day to the next. They justify this when they say that agency has ‘multiple, overlapping ways of ordering time toward which social actors can assume different simultaneous agentic orientations’ (p. 963-964). They also argue that the structural environments in which actions are constructed and reconstructed play a role in the realisation of those actions when they say that the ‘structural contexts of action are themselves temporal as well as relational fields—because it recognises the temporal nature of agency’ (p. 963).

	PAST	FUTURE	PRESENT
ITERATIONAL	Selective Attention Recognition of Type Categorical Location	Expectation Maintenance	Tacit Manoeuvre
PROJECTIVE	Identification	Narrative Construction Symbolic Recomposition Hypothetical Resolutions	Experimentation
PRACTICAL-EVALUATIVE	Characterization	Deliberation	Problematization Decision Execution

Figure 2: A diagram of Emirbayer and Mische’s (1998) three dimensions of agency.

Emirbayer and Mische conceptualise agency as three dimensions that work together in harmony, see Figure 2. They use the metaphor of tonality

to explain how the three dimensions form a ‘chordal triad’ of component elements (p, 970). Each component element plays a dominant note in the flow of a specific point in time – the past, future or present – and plays a minor note in the others. The three dimensions are defined as *Iterational*, *Projective*, and *Practical-Evaluative*. I will look at each in turn and explain how each dimension dominates tonally within a specific time space.

First the *Iterational* dimension of agency. Emirbayer and Mische argue that this dimension is all about the past and that past experiences, which go on to become repeated actions that form habits, are agentic and not restricted to an automatic reaction to a specific situation. In their own words:

> It refers to the selective reactivation by actors of past patterns of thought and action, as routinely incorporated in practical activity, thereby giving stability and order to social universes and helping to sustain identities, interactions, and institutions overtime (1998, p. 971).

Emirbayer and Mische explain that the *Iterational* dimension of agency is the most difficult dimension to conceive, and it is tonally all about the past – past experiences. In other words, experiences relating to routinisation. They use the concept ‘iterational’ to make the familiarity of human ‘routines, dispositions, preconceptions, competences, schemes, patterns, typification and traditions unfamiliar’ (Emirbayer and Mische 1998, p. 975). The *Iterational* dimension can also relate to the use of tools chosen in the past, which influence routines. The notion of habit as something more

than stimulus and response is not original to Emirbayer and Mische when they discuss how their ideas build on from historical ideas of habit from Aristotle (2009, p. 23) and Dewey (1922, 24 - 42). Also, past influences from Bourdieu (1977, p. 80) and Giddens (1984, p. 5).

	PAST	FUTURE	PRESENT
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Figure 3: A diagram of Emirbayer and Mische's (1998) iterational dimension of agency.

They break the Iterational dimension of agency down into five sub-component elements, see Figure 3. Three dominant in the past and one of each dominant in the future and present. The present tones can be mobilised through the actors' choice of habits from the past when they need them - Selective Attention, the actors' typical habits chosen in relation to future activities - Recognition of Type and things actors do (identity) with others or in a given situation related to past experiences (value) - Categorical Location. The future tone can be mobilised through an actor's reliable knowledge, similar to Giddens (1984, p. 5) reflexive monitoring of action. Actors predict what will happen based on what they

perceive to be infallible and if things change or get disrupted then their expectations are maintained - Expectation Maintenance. Actors move between the habits and routines of the past depending on what is needed in the present – Manoeuvre.

In other words, the iterational dimension of teacher agency influences teachers' engagement with a subject change through the use of personal knowledge. Knowledge of past habits (what works and does not work) and traditions (what teachers do and do not do) that might help the teacher to predict how the change will go.

Second the *Projective* dimension of agency. Emirbayer and Mische (1998, p. 984) theorise this dimension of agency around potential, when they say 'agentic processes give shape and direction to future possibilities'. They differ from other theorists who they observe restrict agency to the *Iterational* dimension. They observe that 'Bourdieu and Giddens do in fact, recuperate the creative, improvisational, and foresightful dimensions of the implementation of practical schemas of action' (p, 983) acknowledging the projective dimension of Emirbayer and Mische's theory, but locating it in the past. A past that only shapes the creative imagination of what could be:

> the imaginative generation by actors of possible future trajectories of action, in which received structures of thought and action may be creatively reconfigured in relation to actors' hopes, fears, and desires for the future (1998, p. 971).

	PAST	FUTURE	PRESENT
ITERATIONAL	Selective Attention Recognition of Type Categorical Location	Expectation Maintenance	Tacit Manoeuvre
PROJECTIVE	Identification	Narrative Construction Symbolic Recomposition Hypothetical Resolutions	Experimentation
PRACTICAL-EVALUATIVE	Characterization	Deliberation	Problematization Decision Execution

Figure 4: A diagram of Emirbayer and Mische's (1998) projective dimension of agency.

The *Projective* dimension of agency has an internal structure comprising five sub-component elements, see Figure 4. Three are dominant within the temporal field of future, one is dominant in the past and one in the present. The future tones can be mobilised through the consideration of stories of past experiences - *Narrative Construction*, the insertion of the actors, themselves, into a variety of possible trajectories or paths - *Symbolic Recomposition*, and actors survey their maps of action and decide on a strategic course of action - *Hypothetical Resolutions*. The past tone supports the future sub-components, this is because actors draw on past experiences to identify patterns of what happened, which helps an actor to evaluate their new course of action - *Identification* and then actors test out their imagined scenarios - *Experimentation*, in the present.

In other words, the projective dimension of teacher agency enables

teachers to socially engage with a subject change through the imagining of possible scenarios that describe pathways and maps of action based on stories of past experiences (the way they construct a description, for example, my knowledge of the way past funding opportunities opened up the possibilities for future projects). Which help a teacher to identify the risks and opportunities associated with such imagined scenarios to inform experimentation and the testing out of new (imagined pathways and maps of action) in the present.

Third, the *Practical-Evaluative* dimension of agency according to Emirbayer and Mische's theory. The *Practical-Evaluative* dimension of action is all about real-time actors' responses, which are based upon practical wisdoms made in situ. In their own words:

> the capacity of actors to make practical and normative judgments among alternative possible trajectories of action, in response to the emerging demands, dilemmas, and ambiguities of presently evolving situations (1998, p. 971).

The capacity of actors to respond to real-time evolving situations relates to the Aristotelian perspectives on practical wisdom. A wisdom based on actors 'values, interests and purposes' (p. 995) that inform responses as they play a role in reasoning over different courses of action. What is not captured in the quote above is Emirbayer and Mische's recognition that actors deliberate over courses of action through self-reflection (autonomy) and conversations with others (communities of discourse). This differs to Fullan's argument that the technical culture of schools leads to decisions

about practice based on:

> pragmatic trial-and-error grounds with little chance for reflection or thinking through the rationale (Fullan 2015, p. 21).

	PAST	FUTURE	PRESENT
ITERATIONAL	Selective Attention Recognition of Type Categorical Location	Expectation Maintenance	Tacit Manoeuvre
PROJECTIVE	Identification	Narrative Construction Symbolic Recomposition Hypothetical Resolutions	Experimentation
PRACTICAL-EVALUATIVE	Characterization	Deliberation	Problematization Decision Execution

Figure 5: A diagram of Emirbayer and Mische's (1998) practical-evaluative dimension of agency.

The *Practical-Evaluative* dimension of agency also has an internal structure comprising five sub-component elements, see Figure 5. Three have dominant tones in the present; one has a dominant tone in the past and one has a dominant tone in the future. The present tone can be actioned through recognition that something must be done - *Problematization*, act here and now with an end-in-view - *Decision*, and the capacity to act by grasping what we need to do - *Execution*. The past tone reflect the repeated actions in the present - *Characterization* that influence choices made in light of intellectual and emotional; perceptions and possibilities – *Pondering*, which relate to plans for the future.

In other words, the practical-evaluative dimension of teacher agency is all

about practical wisdom and captures an orientation towards the present that is informed by the past and future. In the present, teachers have a problem to solve, something in their practical situation requires a resolution (for example, they have to develop pupils' knowledge of a material area that they have not taught for a while); so they call upon past actions and events that will help them to characterise the problem and debate possible outcomes. By drawing on the past and future the teachers are able to make decisions about what course of action to take and then act.

In sum, Emirbayer and Mische's conception of human agency offers a definition of agency as a human's capacity to act in time-related ways that influence the shape of their social world. Within education Scott (2007) defines agency as:

> a term used by educational researchers to describe the active and intentional role of the individual in the construction and reconstruction of social life (Scott 2007, p. 8).

Priestley, Biesta and Robinson (2015) have built on Emirbayer and Mische's (1998) theory of agency to develop an understanding of agency that is specific to teachers working in Scotland. Like myself, they were interested in developing knowledge of teachers' behaviours in response to a curriculum change in Scotland (Education Scotland 2022). Priestley, Biesta and Robinson define teacher agency as temporal, emergent and relational. Building on Emirbayer and Mische's three tones of agency, they develop their concepts into a framework for understanding teachers'

achievement of agency. The framework adapts the work of Emirbayer and Mische to develop a framework that views achievement of agency as both individual and ecological. By ecological Priestley, Biesta and Robinson mean that agency is dependent on the opportunities afforded within a teacher's organisation alongside individual capabilities to make a difference through intended actions. This relates to Giddens (1984) model of agency that recognises the unacknowledged conditions of action, see Figure 1. Priestley, Biesta and Robinson's (2015) study uses Emirbayer and Mische's (1998) theory of agency to show that teachers' capacity to innovate subject teaching is dependent on a combination of opportunities provided by the school or department and the teachers' individual capabilities to take action, as expressed through three dimensions.

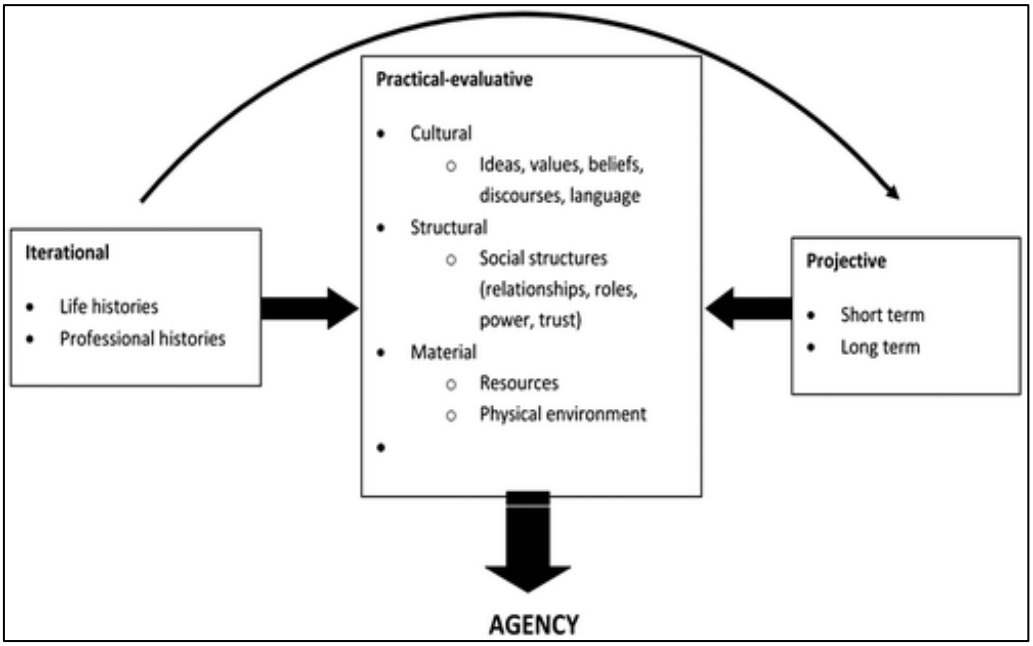


Figure 6: A model of understanding the achievement of agency, in Priestley, Biesta and Robinson, (2015, p. 627).

Unlike Emirbayer and Mische's conceptualisation of agency as a set of tones, they visually represent teacher agency through a framework that

breaks apart the key features of each dimension, see Figure 6. Within the model they re-classify the iterational dimension as life histories and professional histories. For Biesta, Priestley and Robinson, life histories play less of a role than the teachers' professional histories, which focus on a teacher's past education and past experience, whilst working as a teacher. For them, the projective dimension consists of short and long term reasons for action. The imagining of future possibilities (Emirbayer and Mische 1998), alongside Giddens (1984) motivation to act, are reconceptualised to focus on short and long term ambitions related to pupil welfare and development, values and beliefs, or different objectives associated with maintaining standards in school (Priestley, Biesta and Robinson 2015, p. 30). The practical-evaluative dimension, which refers to the judgements made in the present (Emirbayer and Mische 1998) are divided into three aspects, cultural, material and structural, which they explain below:

> Cultural aspects have to do with ways of speaking and thinking, values, beliefs and aspirations, and encompass both inner and outer dialogue. Material aspects have to do with the resources that promote or hinder agency and the wider physical environment in and through which agency is achieved. Structural aspects have to do with the social structures and relational resources that contribute to the achievement of agency (Priestley, Biesta and Robinson 2015, p. 30).

Priestley, Biesta and Robinson progress Emirbayer and Mische's (1998) definition of agency as the capacity of humans to act in time-related ways

by acknowledging the relational aspects of agency achievement that impact teachers' capacity to influence the shape of their social world. Priestley, Biesta and Robinson, also offer a practical way to understand the achievement of agency by framing the different aspects across the three dimensions. I have drawn on Priestley, Biesta and Robinson's (2015) framing of the achievement of agency to adapt Emirbayer and Mische's dimensions of agency into a set of focus areas and questions, designed to support my study, see Figure 7.

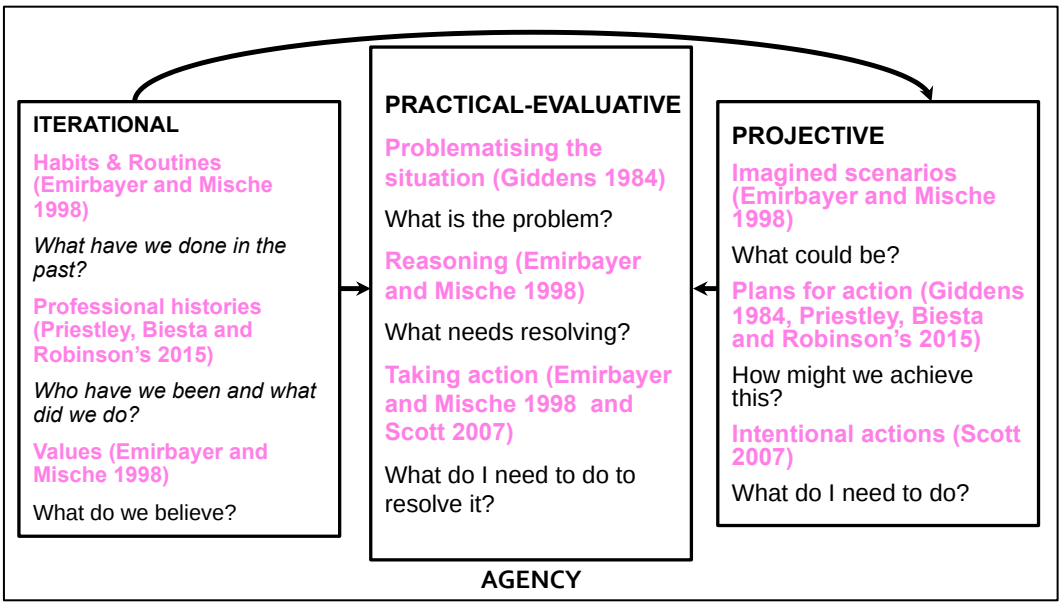


Figure 7: A framework for understanding design and technology teachers achievment of agency derived from the literature.

Buchanan (2015) has also drawn on Priestley, Biesta and Robinson's (2015) ecological agency framework to research nine teachers working through a reform. This study does not explicitly answer questions within a secondary design and technology context. However, Buchanan's study highlights the different ways that social norms within society shape teachers' practices. She argues that teacher agency (and identity) are

‘born of past experiences, and shaped by current circumstances’, which echoes Emirbayer and Mische’s (1998) theory of past, present and future agency. The combination of past, future and current contexts means that achievement of agency is ‘constantly in motion [...] as teachers engage in their daily practices and reflect on their work’ (Buchanan 2015, p. 704). In addition, Buchanan found that teachers working through a changing context used a process of reflection to form actions that had the potential to reform (rather than reconstitute) normative behaviours. Although this study does not directly use reflection as a tool to generate data, it will be interesting to see how different past experiences inform current actions. The work of Hargreaves (2005, p. 967) is helpful here, where he argues that change is influenced by a ‘teachers age’, as well as their ‘stage of career’. In other word’s Hargreaves believes that the stage of a teacher’s career brings different capabilities towards the promotion of, or resistance, to change. He says that schools need a mixture of different demographics in their teaching staff to ensure mentoring across the generations and memory from wisdom and learning.

Both Buchannan, and Priestley, Biesta and Robinson’s (2015) expansion of Emirbayer and Mische’s (1998) conception of agency resonates with Giddens development of ideas about agency, as expressed through his essay ‘Living in a Post-Traditional Society’ (Giddens 1994). Giddens developed theories about agency and structure (structuration) from ideas about modernity and how society remains traditional. Knowledge and power sit within a western ideology that privileges the reproduction of tradition through cultural ideas, beliefs and aspirations (Priestley, Biesta

and Robinson 2015) and the recognition of type that forms habits (Emirbayer and Mische 1998). Using Giddens' (1994, p. 105) ideas about change as a clash of values between those with power – the 'collective' and the 'individual'. The policy reform can be conceptualised as a clash between the policy aims (driven by governmental reform) and individual design and technology teacher values about the habits and routines of the culture. Giddens analyses the results to change as a set of a four types of response:

- embedded tradition - any new practice or process rooted in resources and practice from the past;
- professional dialogue - the interchange of ideas between groups of teachers;
- professional disengagement - includes actions or processes that result in a withdrawal from the change;
- coercion - the practice of persuading someone to do something by using force or threat (Giddens 1994, p. 104 - 107).

The four types of response, typify the impact that change can bring and suggest a need to engage in dialogue that supports choices and decisions within a teachers' social world. Therefore, design and technology teachers will need access to groups of teachers to promote the types of dialogue required to align individual values to the collective aims of the policy reform and transition from one traditional practice to another.

This section leaves us with an understanding of how theories of agency can be used to consider a teacher's work and the decisions they make to

shape their social world. The ideas will support the project's aim to develop knowledge of design and technology teachers' experiences of change and lead to relevant descriptions of achievement of agency. As a consequence of the literature review discussed so far, I have developed a diagram of the conceptual framework used to support the project, see Figure 8.

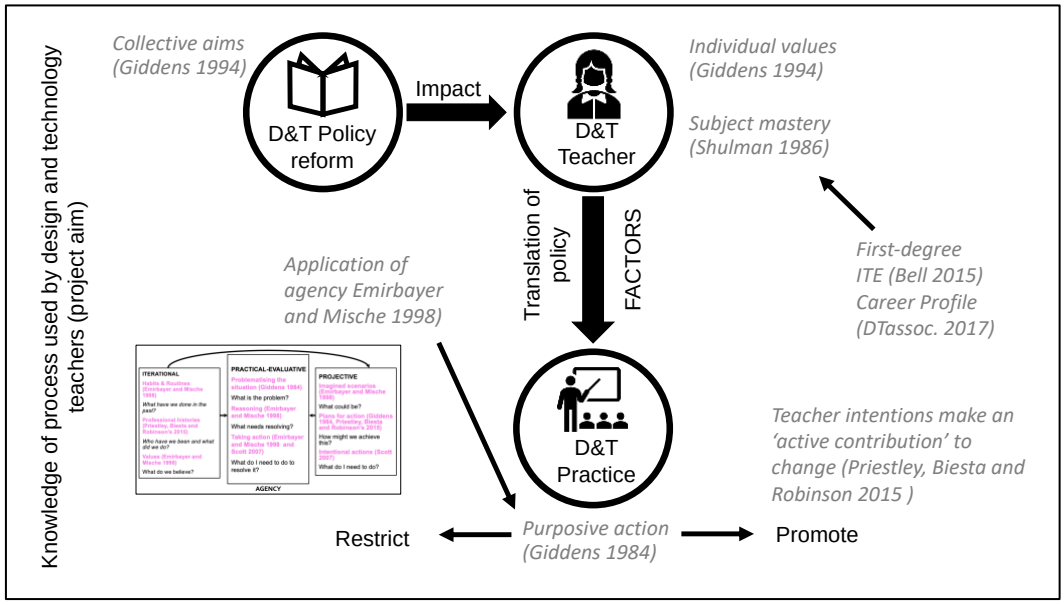


Figure 8: Diagram of the projects conceptual framework.

2.2 The history of design and technology policy development and practice

In this section I am reviewing the literature to provide an overview of the past policy developments that have shaped the subject's habits and routines, and how teachers have historically applied their agency to the issues and challenges of the time. This section builds on the section before by using historical policy documents and published research to review current knowledge about teachers and teaching in design and

technology. The section is organised into five parts that each focus on a different iteration of the subject, as espoused by Martin (2013). Each of the five parts draw on policy documents and pieces of literature to characterise the specific era and nature of teaching at that time. The section aims to generate knowledge about what is already known, from a historical perspective, about answers to the research question:

- what are the specific issues and challenges that design and technology teachers face when translating policy development into practice?

Although research from other countries is used to analyse teachers' past experiences and responses to change, the main focus is on practice in England.

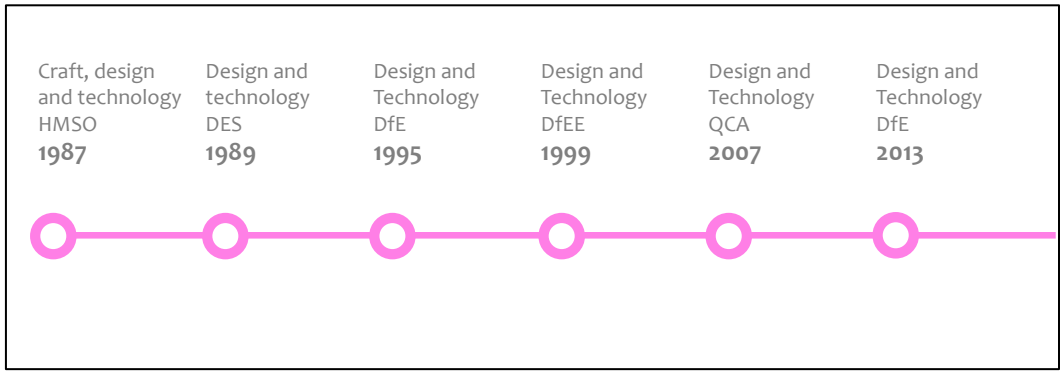


Figure 9: Timeline of policy developments within an English context.

The history of the English National Curriculum (NC) subject called - design and technology, started with the 1988 Educational Reform Act and the introduction of practical learning within general education (Wakefield and Owen-Jackson 2013, Gillard 2011). A starting point that has developed through six policy reforms over thirty years, see Figure 9. However, it is not appropriate to discuss the developments of practical

teaching within general education without first reviewing the subjects known starting points within education.

2.2.1 The ‘making’ era

The ‘making’ iteration of practical education relates to pre-1960s curriculum (Martin 2013). An era when practical education was taught within elementary and secondary modern education systems for the purpose of teaching craft skills to boys and domestic skills to girls (Wakefield and Owen-Jackson 2013). Practical subjects that built on the:

> craft-based work of blacksmiths, carpenters, cooks and seamstresses dating back hundreds of years (Martin 2013, p. 319).

Traditional craft-based work that mimicked the trades (Wakefield and Owen-Jackson 2013) through practical lessons that focused on manual training for non-academic pupils, specifically boys ‘deemed to be good with their hands’ (Penfold 1988, p. 20). Martin (2013) suggests that a feature of design and technology during the making iteration was the development of pupil knowledge about the types of materials and their working properties. He goes on to explain that pupils would be taught process knowledge via workshop skills. For example, my father attended a secondary modern school during this period (1950s) where he studied woodwork and metalwork in a workshop environment alongside other boys. My father, recalls using tools and equipment to make a wooden stool (that he still owns today) and a copper gong and hammer. He also recalls lessons on leatherwork, in which he learnt the trade of shoe repair. This iteration of the subject gave my father craft-based skills that he used

throughout his working life as an upholsterer.

In contrast, my mother's memories of practical education, at her secondary modern school, included learning to cook and sew, under the subject title of home economics. Somewhat different to my father's experience of practical learning. Home economics education had more of a domestic than trade focus (Penfold 1988). My mother remembers studying these lessons in a separate building that mimicked a family home (called The Bungalow). The lessons were taught to girls only and included the study of cooking, housework and needlework. She remembers learning to do the laundry and making a cross-stitch sampler for her home. My mother does not recollect any mention of learning a trade and felt that a lot of her time was spent on domestic housework skills – she recalled the feature of repeated washing-up activities. It appears that Martin's definition of the pre-1960s 'making' era of a craft-based education, situated in the trades, fails to capture the domestic side that was a characteristic of this period of subject development. Both subjects were mainly taught in secondary modern schools and emphasised hand skills. However, the separation of the subject for boys and girls reflected inequalities at the time. Not only inequalities between the sexes but also, as Penfold (1988, p. 112) observed a variation in the way the subject was taught between traditionalists, who focused on teaching 'manipulative skills' and progressives, who focused on the use of 'questioning'.

2.2.2 The 'personalising' era

The 'personalising' iteration of practical education relates to the

establishment of the subject craft, design and technology (CDT) in comprehensive education in the 1970s and 1980s (Martin 2013). An era when the subject led to a qualification and could be taught to both girls and boys (Penfold 1988). The new subject had aspects of craft teaching including woodwork, metalwork and technical drawing (Association of Advisors in Design and Technology Studies 1980) with the addition of design content that promoted project-based activities. Project-based activities were a new form of pedagogy, at the time, and they aimed to develop competencies, in learners, across technological, aesthetic and creative areas of learning. Project-based activities did this through the development of different facets, as described in the Association of Advisers in Design and Technical Studies report to the 1980 Conference by The Curriculum Working Party as:

- facet 1: Giving form and substance to an idea by interpreting it in appropriate material;
- facet 2: The use of materials, tools and processes;
- facet 3: Inventiveness ingenuity;
- facet 4: Objectivity (Association of Advisors in Design and Technology Studies 1980, p. 6 - 7).

These facets led to Martin's argument for the personalising of the subject curricula in this era. Martin, a teacher at the time, describes a project where he started to offer pupils an amount of choice in what they made (facet 3). He recalls how he adapted a clock project that previously focused on developing skills in the use of sheet-material, cutting tools and

soldering (facet 2) to one that developed pupils creativity (facet 3) through individual decisions about the shape and material for the project. The pupils were allowed to interpret the shape of the clock (facet 1) in comparison to my father's experience of following instructions that led to his use of materials, tools and processes in the making of a household item identical to his classmates (facet 2 and 4). This move to CDT contrasted to the previous iteration not only in the choices it afforded pupils in relation to how they made objects but in other ways related to the introduction of examinations and the move to teach both boys and girls. During this era, I was at secondary school and my own experience of CDT at school involved the construction of a 2D 'alien'. I was presented with the challenge of manipulating various sheet-metals into an alien shape that contained open sections (facet 1). This activity introduced me to the skills of using metalwork tools and the processes of cutting and polishing (facet 2). I remember having to solve the problem set by the teacher and working with unfamiliar tools to achieve the result. However, although I enjoyed using the unfamiliar equipment my time in the CDT workshop was shorter than time spent in home economics. Therefore, I never got to finish my alien project (facet 4). Although, the comprehensive school I attended did not include home economics (including needlework) as a part of CDT it was a good experience for me to have. The shift to CDT from craft-based lessons offered experiences to both boys and girls, alongside the move to examinations and a focus on project-based activities. This meant that practical education was starting to address inequalities through an increase in breadth and legitimisation of the

subject, which gave teachers new professional experiences that potentially supported their iterational dimension of agency (Emirbayer and Mische 1998).

For the teachers of CDT this meant a challenge to previous ways of teaching. A challenge to how teachers adapted curriculum from one that prepared pupils for careers in the trades (or the role of a housewife) and into a curriculum that taught all pupils to 'identify, examine and solve practical problems' (Department of Education and Science 1987, p. 3). The teachers faced new practices that were unfamiliar and potentially risky. Penfold (1988, p. 59 - 60) described how one of these new practices was the organisation of curriculum into a carousel of lessons, called a 'CDT circus'. The carousel organised the teaching of CDT into a 'circus system where girls and boys circulated from one activity to the next at termly or half termly intervals' (Penfold 1988, p. 59 - 60). A tradition that is still seen in the schools I visit today, and which as Penfold explained at the time was chosen to offer affordable solutions to teaching all pupils all areas of design and technology. Nevertheless, this shift to teaching both trade and domestic practical skills through the single subject of CDT was criticised in relation to reduced time for boys to develop their technological understanding. Penfold (1988) describes this criticism as having 'sexist overtones' that hinted at a breakdown in shared ideas about the subject across the traditional teaching areas.

2.2.3 The 'designing' era

The 'designing' iteration relates to policy developments towards the end of

the 1980s that introduced the first National Curriculum for design and technology, in England (Martin 2013). A period that demonstrated great ambitions for the subject as it transitioned from practical to general education. The subject became a part of the established curriculum (Department of Education and Science and the Welsh Office 1989) and adopted the new name - design and technology – which it holds today. A place in the National Curriculum recognised the subject as an important aspect of pupil learning equal to learning in English, science and maths. However, in contrast to these established subjects, design and technology was pitched as something new. In the words of the Design and Technology Working Group, a ‘challenging and new’ subject that enabled young people to ‘cope with a rapidly changing society’ (Department of Education and Science and the Welsh Office 1989, p. vii). A rapidly changing society that needed to educate young people – both boys and girls - in science (including applied science) and technology (Bell 2015). Design and technology was recognised as a pathway to applied science teaching and the growth of young peoples’ technological capability. Capabilities that Archer, Baynes and Roberts (1992, p. 10) described as spanning ‘the curriculum’ and drawing upon ‘art and design, business education, CDT and home economics’. The combining of various subjects established the ambition of a subject that aimed to offer opportunities for young people to amongst other things:

- investigate, design, make and appraise;
- [through the] design and making of original or better products;
- [to support] future prosperity of our business and industry

(Department of Education and Science and the Welsh Office 1989, p. 1).

A subject that contributed to economic purposes, and which therefore, made the subject economically relevant (McGimpsey 2011, p. 21) and therefore legitimate in the new National Curriculum.

The new subject with economic relevance that bought together teachers and teaching from art and design, business education, CDT and home economics. Each subject was given equal status and amalgamated via a set of shared principles for teaching. These were defined in the new policy orders as:

- knowledge which serves as a resource for pupils' design and technological activity;
- skills which pupils will need to develop;
- contexts in which design and technological activities are to take place;
- value considerations associated with design and technological activities;
- activities through which design and technological capability should be developed (Department of Education and Science and the Welsh Office 1989, p. 9).

The five principles created a thread linking the different subject areas that could be applied across 'natural and manufactured materials' (Department of Education and Science and the Welsh Office 1989, p. 31). The

knowledge and skills associated with the different natural and manufactured materials that art and design, CDT and home economics teachers taught was specialist and unique. However the teaching of contexts and value considerations were perceived as generic. Past iterations of CDT and home economics might not have emphasised these aspects but they held an important place within the subjects when teaching young people to navigate a rapidly changing society. A rapidly changing society that required young people to take action through the design process. A process that was outlined in the initial CDT curriculum matters pamphlet (Department of Education and Science 1987) and developed throughout the new orders. The new orders divided the design process into a set of attainment targets, four general and one linked to information technology (IT):

- AT1: Identifying needs and opportunities;
- AT2: Generating a design proposal;
- AT3: Planning and making;
- AT4: Appraising;
- AT: IT (Department of Education and Science and the Welsh Office 1989, p. v).

The principles for teaching and four generic attainment targets established the new subject with a common goal. A new goal that through the bringing together of different disciplinary subjects created a distinct form of multi-disciplinary education with strong ambitions. Aspirations that amalgamated the discipline of design with technology to teach the

process of creating (or making) concrete outcomes that meet the needs and wants of users (within a ‘functional, commercial and social context’) through the embodiment of ‘technological, economic, marketing, aesthetic, ecological, cultural and ethical values’ (Archer, Baynes and Roberts 1992, p. 8).

The drive to establish the new subject within the curriculum required teachers to come together. The new orders brought the teachers together through the design process and shared attainment targets. Both dimensions had started to be developed within the teaching of CDT but were not common to home economics teaching and therefore, home economics teachers (those teachers that originally taught cooking and sewing). The new curriculum encouraged common approaches to teaching through the sharing of knowledge within departments. The orders suggested that teachers would benefit from training in the different areas as a way to appreciate ‘colleagues with differing expertise’ and more knowledge in a specific area (Vygotsky and Cole 1978). They went on to recommend that training:

> could take place ‘on the job’. Many teachers are already experienced in aspects of the design and technology curriculum and could pass on that experience in the course of day-to-day work with other teachers. Those responsible in schools for the organisation and the deployment of resources will also need to be aware of the requirements of the subject (Department of Education and Science and the Welsh Office 1989, p. 2).

On the job training and the organisation of resources in school fell squarely onto the school and teachers themselves. However, the common thread of designing and making did not prove so easy to stitch into the practices of design and technology teachers. Specifically, certain factors caused tensions, including the teachers' past experiences, the openness of the curriculum's ambition and the resolution to deal with the sophisticated nature of pedagogy through project rotations. The continuation of the CDT circus of projects (Penfold 1988) kept the original home economics and CDT separate and loosened the threads needed to bring the new subject together. The organisation of curriculum through rotations stifled the 'sophisticated pedagogy' (McGimpsey 2011, p. 15 - 16) required to challenge pupils to meet the aims of contextual research and therefore, the attainment targets. The combination of limited past experiences, open curriculum and teaching in rotations revealed the difficulties of embedding a new subject without extensive support for teacher professional development. This professional development beyond in-house collaboration required a level of support from others in the school setting or changes to teacher preparation and ongoing professional development.

However, in conversation with two ex-teachers of home economics that trained in the 1980s, I learned that teacher preparation courses included aspects of design as part of their original food science degree or the new teacher preparation qualification. Other examples of this shift come through Martin's (2013, p. 320) observation that he first started to read about design education during his early teaching when Kimbell's (1982)

influential book ‘Design Education: The Foundation Years’, was making a ‘significant impact’ on his practice. Nevertheless, the reliance upon ‘on the job’ training (Department of Education and Science and the Welsh Office 1989, p. 2) made for a less structured and incongruent implementation of this ambitious new subject. Research into the new subject by Paechter (1995) explored how departments in London, negotiated the initial policy aims. Her research identified the loses and gains for the teachers involved when delivering the new subject. She found that the open nature and lack of detail about what the curriculum aspirations (Department of Education and Science and the Welsh Office 1989, Archer, Baynes and Roberts 1992) looked like in practice, led to significant challenges for the teachers. Problems that were made worse through a lack of challenge, by leadership, towards the teachers and habits that reinforced old ways of working. Old ways of working through individual subject disciplines that promoted a form of subcultural retreat (Paechter 1995, p. 81).

2.2.4 The ‘manufacturing’ era

The ‘manufacturing’ iteration relates to rapidly changing practices in industry that impacted practice in design and technology (Martin 2013). An era that saw the subject reduce some of the over ambitious content of the first policy, whilst simultaneously growing the role of manufacturing within the curriculum (Department for Education 1995, Department for Education and Employment 1999). The content was reduced to address the difficulties associated with subject teaching, identified in a series of reports from Her Majesty’s Inspectorate (HMI) and the National

Curriculum Council (McCormick 2002, p. 40). The reports recognised the difficulties of teaching projects based on contextual research and reduced what was to be taught from five to three principles, then increased the principles to six. See Table 1, for a comparison of developments. The reduction of principles was achieved by ‘incorporating planning and evaluation within designing and making’ (McGimpsey 2011, p. 9). The new iteration dropped the inclusion of IT which went on to become a separate subject within the National Curriculum (McCormick 2002, p. 41) and the lack of pedagogical guidance was resolved with the introduction of three ways to teach the content. These included:

- assignments in which they design and make products;
- focused practical tasks in which they develop and practice particular skills and knowledge;
- activities in which they investigate, disassemble and evaluate simple products (Department for Education 1995, p. 2).

These three approaches remained within policy documents, through to 2014, however, classroom activities that involved the design and make of products became the main subject pedagogy for the subject (Tovey, 2015). The content and additional guidance bought clarity and simplification by defining the main activities that teachers should use to teach their learners. A move welcomed by Breckon (2000) and DTassoc, but not shared by Martin and Riggs (1999), who emphasised the loss of working with contexts as a consequence of a focus on products.

DES 1989	DfE 1995	DfEE 1999
Knowledge Skills Contexts Value considerations Activities	Designing skills Making skills Knowledge and understanding	Developing, planning and communicating ideas Working with tools, equipment, materials and components to make quality products Evaluating processes and products Knowledge and understanding of materials and components Knowledge and understanding of structures Knowledge and understanding of systems and control 3&4

Table 1: A comparison of the content to be taught over three iterations of National Curriculum policy between 1989 – 1999.

The new subject refined the content and clarified ways that the subject could be taught, whilst increasing the emphasis on industrial practices. The new orders recognised not only the need to teach young people about a rapidly changing society but for teachers to be up to date with those technologies. This meant a rise in industrial processes and the use of computer aided design (CAD) to design products and computer aided technology (CAM) for manufacture (Martin 2013). The reason for this move to industrial processes was explained as a consequence of the involvement of the Engineering Council (Martin 2013, McCormick 1990) which aligned the subject to industry. A move that threatened criticality within the subject (The Fashion Praxis Collective 2014). In turn compromising subject neutrality and opening up a reliance on industrial equipment. This was also significant in debates at the time about the nature of the subject and the role afforded by the design and technology

community in the evolution of the subject (McCormick 1990). It was a subject that did not evolve from universities but through committees of policy writers, which rarely included members of the design and technology community. McCormick observed that ‘only one member represented the world of practising technologists’ (1990, p. 45). Layton (1994) used his paper, *Constructing and reconstructing school technology in England and Wales*, to review the state of design and technology education by considering how the concept of the subject was formed. Using newspaper articles, current affairs TV programmes, curriculum policy documents, government white papers and his own experiences during the time, Layton identified that design and technology had no epistemological roots to tie it to a unique type of learning, instead he argued that the subject design and technology had come about through unplanned policy that disregarded issues of teacher education and supply. He cites episodes in the various stages of the subject’s history to claim that design and technology was:

> an instrument for the achievement of other educational policies such as making pupils’ experiences of schooling more ‘practical’ and related to the world of work, breaking down the divide between academic and vocational studies, and contributing to the supply of technological skills essential to the economy (Layton 1994, p. 114).

The focus on economic purposes generated a tension between the push towards design aims established in the previous curriculum iteration (Department for Education 1995) and a pull towards making using a higher level of industrial processes.

2.2.5 The ‘valuing’ era

The ‘valuing’ iteration relates to changes in the subject that demanded greater designing and making skills that combined with an emphasis on judgement about the work of others (Martin 2013). In this period policy developments aimed to emphasise pupil understanding of the impact of design and technology on and in society, alongside a return to design concerns. Manufacturing foci were not abandoned during this period, increasing the content for both teachers and learners. The policy development progressed the vision of the subject towards environmentally conscious ways to design and make. The emphasis, although still focused on designing and making products (Spendlove 2011), included incentives to consider whether we ought to make those products in the first place (Martin 2013, p. 322). Martin went on to define this era in design and technology teaching as one that demonstrated a ‘growing interest in values issues within the subject’. Values that taught pupils to ‘understand human need and the extent to which products’ would meet those needs (2013, p. 323). Martin’s evaluation of this era acknowledged that values and issues around consumption (Department for Education and Employment 1999) and changes in society (Department of Education and Science and the Welsh Office 1989, Department for Education and Employment 1999) had been a part of the subject already but it was only during this period that teachers started to develop this aspect in their learners. For example, the curriculum orders directed teachers to develop pupil understanding about ‘environmental’ and ‘ethical’ dimensions and their impact on the world alongside cultural understanding associated with

‘users’ and ‘designers’, ‘ethics and values’ (Qualifications and Curriculum Authority 2007, p. 52). Kimbell (2004, p. 47) claimed that this version of the published curriculum orders ‘encapsulated the vision that has driven the evolution of the subject’ and set out the kind of design and technology young people needed, developing an epistemology that refuted Layton’s (1994) claims. In addition, the inclusion of content focused on valuing, started to promote child-centred (Ellis 2014) curriculum concerns, and an emphasis on concepts and processes rather than knowledge. However, the new orders continued to define the activities teachers should use to teach the subject, including the key processes of:

- generate, develop, model and communicate ideas in a range of ways, using appropriate strategies;
- respond creatively to briefs;
- apply their knowledge and understanding of a range of materials;
- use their understanding of others’ designing to inform their own;
- plan and organise activities;
- evaluate which hand and machine tools, are the most appropriate to use (Qualifications and Curriculum Authority 2007).

The key processes were also defined through the inclusion of orders to teach through a range of specialisms including resistant materials, food, textiles, and systems and control (Qualifications and Curriculum Authority 2007, p. 55). Wakefield and Owen-Jackson (2013, p. 18) observed that:

> food was pitted against textiles in that pupils’ study should include ‘at least one of food or textiles’ (Wakefield and Owen-Jackson

2013, p. 18).

No justification for this clause was given, however, food had been stipulated as an option in addition (or as a replacement) to ‘compliant materials’ (textiles) in policy since 1995 (Department for Education 1995, Department for Education and Employment 1999). The change of name and optional nature of both food and textiles appeared to continue the CDT bias raised by Penfold (1988) at the start of the subject within general curriculum. Nevertheless, the new orders emphasised the impact of technology and the importance of design in society. The prominence of pedagogy was a welcome development that encouraged a linear approach and move away from the tradition of carousel teaching.

Professional development in this era attempted to support a non-linear design process and enhanced teaching of designing. The teaching of designing had been identified as a weakness (Ofsted 2008) and a framework for training design and technology teachers was outlined in the Department for Education (Department for Education, 2010) Secondary Strategy. The framework aimed to encourage ‘autonomy, creativity, reflection and group work’ (Department for Education and Skills, 2004, p. 18. The Secondary Strategy prescribed generic teaching and learning strategies to raise the quality of teaching across all subject areas. Specific to design and technology, which arrived towards the end of the Secondary Strategy (Lee and Todd 2004) a set of resources that aimed to improve the design aspect of design and technology teaching. The resources framed the teaching strategies prescribed in the new National Curriculum and offered direct instruction (Adams and Engelmann 1996) for use in

lessons. The framework was originally piloted across 10 local authorities between 2003 and 2004 (Ofsted 2008, p. 48) before a national rollout across schools. The guidance supported teachers in planning for opportunities to teach design activities that were seen as an area of the curriculum that were less well taught than the making side of the curriculum (McLain, et al. 2014). The framework encouraged the teaching of design skills and a non-linear version of the design process. A non-linear version of the design process had been a desire of the design and technology community for some time (Morley 2002, Atkinson 2009, McLain 2012). The return to an emphasis on design was welcomed by those that supported authentic learning (Turnbull 2002) and creativity (Nicholl, et al. 2013) but highlighted the challenge of establishing design oriented pedagogy within a traditional structure of delivery.

In summary, the issues and challenges that teachers have previously faced in relation to policy developments in the subject have shaped the practices that now form the subject. A subject with roots in practical education that developed from vocational purposes aimed at trade to wider academic concerns; a subject that encompasses skills associated with manufacturing alongside knowledge and for designing a better world. For teachers this has created a tension between what was once expected and the need to address new concerns. This section highlights the challenges of bringing multi-disciplinary subjects together and the issue of learning new practices within the changing context of policy reform. The issues and challenges that teachers of design and technology have historically faced (iterational dimension of agency - Emirbayer and Mische

1998, see Section 2.1) include:

- the habits of:
    - craft-based work (Wakefield and Owen-Jackson 2013, Martin 2013);
    - project-based learning (Department of Education and Science 1987);
    - multi-disciplinary subject content (Archer, Baynes and Roberts 1992);
    - industrial equipment (Martin 2013, McCormick 1990);
    - the design process and contextual research (Department of Education and Science 1987);
- preconceptions about:
    - non-academic learners (Penfold 1988);
    - links to business and industry (Martin 2013, McCormick 1990);
- patterns of:
    - CDT circus Penfold (1988);
    - CDT bias Penfold (1988)
    - 'on the job' training (Department of Education and Science and the Welsh Office 1989).

The next section examines the latest iteration of subject policy and the literature around the initial stages of the change.

2.3 Towards a 'knowing' era of design and technology teaching

Building on Martin's (2013) eras of design and technology, I argue that teachers face the start of a new design and technology teaching period called 'knowing', see Figure 10. Although not yet an era, a new phase for teachers that shifts the subject's history in a fresh direction. In this section, I provide an overview of how the current policy context and subject developments differ from previous eras using the literature. The section is organised into three parts that establish the new phase of 'knowing' by first reviewing policy documents to offer a set of subject characteristics and features with which to compare the eras that went before. Secondly, research into policy development implementation is reviewed to identify what is already known about the potential issues and challenges that these might raise for design and technology teachers. Finally, issues around design and technology teachers' (Bell, et al. 2017), subject sub-cultures (Goodson 1998) and boundary-crossing (Darby 2006, Mizzi 2021) offer discussion points for later analysis of my findings (see Chapters 4 and 5).

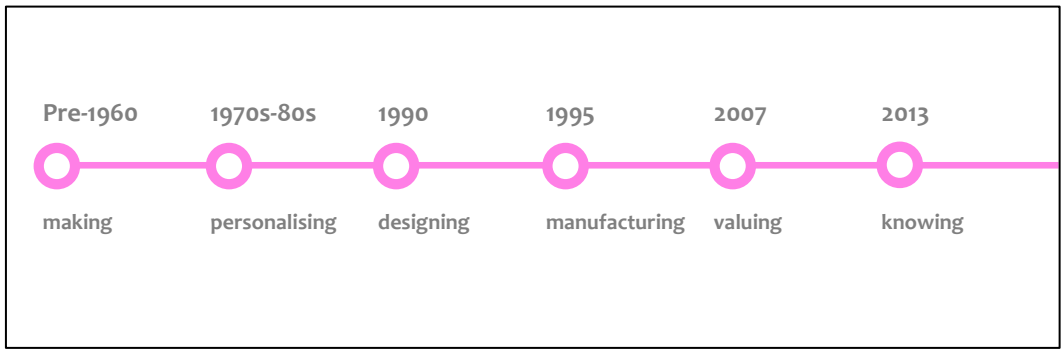


Figure 10: Martin's (2013) five eras of design and make, adapted by Davies (2022).

In 2013, the National Curriculum favoured subjects that contributed to the knowledge economy. This led to a shift towards a knowledge-based

curriculum (Ellis 2014) that favoured traditional forms of knowledge, including English, maths and science. Also, a curriculum that compared favourably to other countries and could be measured through international league tables, and that would be:

> effective in improving pupil engagement, literacy and formal discourse in speech and in writing; and in raising achievement in areas of particular deprivation (Department for Education 2010, p. 15).

Design and technology belongs to a history of practical education rather than traditional forms of knowledge (Wakefield and Owen-Jackson 2013). A practical education with a recent history of developing knowledge in learners that aims to help pupils cope with societal change (Qualifications and Curriculum Authority 2007, Department for Education 1989, 1995, 1999). In relation to contributing to the economy, the DTassoc. argued that the subject makes a vital contribution to the skills economy and jobs in applied Science, Technology, Engineering and Maths (STEM), including careers in ‘Engineering, Manufacturing, Food Science’ etc. (The Design and Technology Association 2011, p 7). However, the government no longer values this type of unique contribution to the economy (McGimpsey 2011). In fact, the perceived lack of alignment between design and technology and traditional subjects that are seen to contribute to the economy explains as to why the subject was not included in the government’s English Baccalaureate (EBacc). In addition, the new design and technology examination system reduce the importance of practical work compared to previous eras.

The government's understanding of traditional forms of knowledge and choice of EBacc subjects is informed by the work of American scholar Hirst (1983). Hirst's theories advocate factual knowledge that is discipline specific and fits with Young and Muller's (2013) idea of 'powerful knowledge'. Through clear subject disciplines, powerful knowledge is taught at 'gradually increasing levels of complexity' (Egan-Simon 2019, p. 1). For design and technology, the new policy consists of a single-subject that develops a unique form of knowledge within learners (Ashbee 2021). A unique knowledge that acknowledges the essence of previous curriculum iterations and can be summed up by Morrison-Love (2016, 2017) as forms of knowledge about materials, users, and products.

The context of the new policy led to several changes within the examination curriculum. The first is the development of learners' understanding of an iterative rather than a linear design process (Department for Education 2015b). Second, the new policy examines design and technology capability through a contextual challenge. The contextual challenge assesses a learner's capacity to identify problems, research, explore, and realise solutions to set problems within a defined timescale. This is not new for design and technology; in fact, the use of a design and make activity to assess design and technology capability has been consistent throughout the eras from 'designing' onwards (Department of Education and Science and the Welsh Office 1989, 1995, 1999, 2007). However, teachers can no longer set the problem within the school centre, and contextual challenges are not material or product specific. The third development, as a consequence of the new policy,

involves the shift to a single-subject (mentioned above). The shift characterises the unique forms of disciplinary knowledge as shared across material specialisms, rather than internal subject differences. For example, the previous GCSE routes of ‘electronic products’, ‘graphic products’, ‘resistant materials’, ‘textiles technology’ and ’systems and control technology’. The new policy ends the previous offer of different endorsed routes within the subject. This means pupils can no longer study one material area in isolation. These changes are a departure from previous eras of the subject. In fact, the introduction of the contextual challenge makes it statutory to teach a non-linear design process, something that has not been made explicit in previous policy documents but desired by Ofsted (2008) and design and technology scholars throughout the subject’s history (Martin and Riggs 1999, Atkinson 2009, McLain 2012). The new policy emphasises some of the fundamentals of the subject from 1990, including a return to contextual research, greater alignment between knowledge across material specialisms and more significant links to other subjects. These changes aim to create an ‘epistemology and curricular identity’ that strengthens arguments for a ‘shared axiomatic, epistemological integration’ (Bell et al. 2017, p. 547) by ending the tradition of endorsed examination routes (Department for Education 2015b, p. 5). In addition, the new policy development aims to enable learners to think through the issues within a situation (contextual challenge) and identify issues that can be individually solved.

In addition, the new policy excludes food technology from KS4 design and technology and emphasises links with other subjects in the curriculum,

specifically science and maths. I will first discuss the exclusion of food. The new policy distinguishes between food technology and food nutrition and preparation. The policy does this by adding additional food specific content to the general (to be studied across all contexts and materials) categories of ‘design’, ‘make’, ‘evaluate’, and ‘technical knowledge’ within the KS3 curriculum and through a separate GCSE examination. Second, science and maths knowledge has been added to the design and technology GCSE at KS4. These two changes differ from previous eras of the subject that pulled together all the separate subjects featured in the ‘making’ and ‘personalising’ eras (Penfold 1988). However, this development echoes the drive to increase the teaching of applied science (Bell et al. 2017), which formed the policy context of the ‘designing’ era.

In summary, I have argued that the ‘knowing’ phase of policy development in design and technology contrasts with previous eras in several ways. First, the shift to powerful knowledge leads to the development of a single-subject definition of curriculum knowledge that contrasts with the history of separate endorsed examination titles under the heading of design and technology. Second, the new curriculum policy explicitly teaches design and make through a non-linear, iterative design process. A design process that is characterised by context specific design problems. Although this is not a new idea (Kimbell and Stables 2008, Stables 2008, Stables 2014), the new policy contrasts previous iterations in the way this is made explicit through the examination contextual challenge (Department for Education 2015b). Finally, the shift to explicitly include scientific and mathematical knowledge within the GCSE whilst excluding

food technology as part of the GCSE examination system. These subject developments can impact teachers' work by challenging established practices and working methods. However, new practices may emerge as design and technology teachers engage with the policy reform (Fullan 2015).

2.3.1 Early research into policy implementation

Initial research into the implementation of the new KS3 curriculum from Ofsted identified several issues with the alignment of teachers' practice to the new aims of the KS3 and GCSE curriculum (Choulerton 2016, Choulerton 2015a, Choulerton 2015b). The new curriculum emphasis on contextual challenge, shared forms of knowledge (not separate material specialisms) and knowledge applied was not initially evident in teachers' actions. The story of how this current policy is translated by teachers is this research projects main contribution.

However, initial observations from the then Ofsted lead - Diana Choulerton (2015a), in her annual address to the DTassoc. Summer Conference identified how teachers were struggling to enact the changes aimed for in the policy. Teaching in KS3 was still seen to be:

- very heavily guided making tasks with very limited opportunities to design;
- very few opportunities to engage in an iterative design process (Choulerton 2015, slide 7-8).

This revealed a continued reluctance to move beyond focused practical

tasks and inauthentic design and make activities. Choulerton also identified an imbalance in time allocated to teaching GCSE folder content. Combined these two actions might expose the teachers' focus on gaining grades and ensuring pupils meet assessment criteria regardless of developing their design and technology capability. The report identified issues with attainment for disadvantaged pupils and boys (Choulerton 2015a, 2015b). The move to a shared knowledge and understanding through the single GCSE was also criticised in that KS3 teaching was still being divided into the old GCSE areas even though the different routes would no longer be available as GCSE options from summer 2019 (Choulerton 2016, slide 12). Hindering 'axiomatic integration' (Bell et al. 2017).

2.3.2 Subject specialism sub-culture

Goodson argues that school subjects have their own 'set of practices and expectations' (Goodson 1998, p. 106). That is to say that they have a particular way of doing things that differs from other subjects in the curriculum. Goodson argues that the practices and expectations that shape a subject, create a subject sub-culture. A subject sub-culture encompass the habits of a subject (see the iterational dimension of agency in Chapter 2), which informs the routines and dispositions that mark one subject out from another. Darby (2006, p. 56) builds on Goodson's work to conceptualise subject sub-cultures as the 'language, epistemology and traditions' that form a boundary around a subject. A boundary that governs practice in the subject field (Winch 2013) through

an aesthetic understanding of the subject sub-culture (Goodson 1998). The aesthetic understanding of a subject creates a culture that dictates the ways that a subject is thought and spoken about, and how teachers of that subject value, believe and envision the shape of a subject (Priestley, Biesta and Robinson 2015). Therefore, the practice of dividing KS3 lessons into the old GCSE material areas of RM, graphics, textiles and electronics can be seen as a continuation of the cultural practices and expectations that form the subject of design and technology within the curriculum, and inform a teacher's ideas about helping their pupils to pass examinations (Doyle et al. 2019).

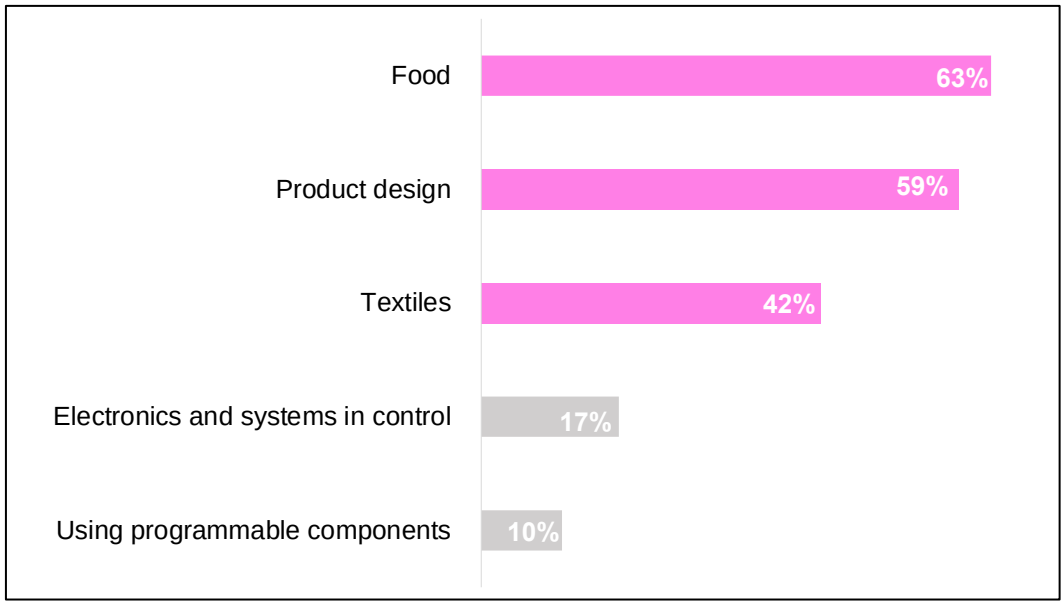


Figure 11: Aspects of KS3 design and technology that teachers feel they are able to teach well – part 1 (Design and Technology Association unpublished).

Cultural practises that in themselves create internal divisions within the subject sub-culture of design and technology. By this I mean that the language, epistemology and traditions of the subject not only differ from

other subjects within the curriculum, but also in relation to the different material areas that encapsulate the endorsed GCSE titles of previous policy iterations. Cultural practices that divide the language of design and technology into three (four, if food technology is included) separate subject sub-cultures. For example, the key ITE textbook for preparing teachers to teach secondary design and technology – Learning to Teach Design and Technology in the Secondary School (Hardy 2020) - presents the knowledge and skills required to teach design and technology through a set of eight separate chapters. Three of the chapters focus on material fields of knowledge and skill, separated into:

- materials technology;
- textiles;
- electronics and control technologies (Hardy 2020, p. v – vi).

The chapters divide the competencies a teacher requires to teach the different aspects of the subject through the above practices and expectations. This is counter to the ‘knowing’ era’s move to stop separating the subject into a set of endorsed GCSE titles and replace them with a single subject qualification (Department for Education 2015b). The idea of a single-subject qualification in design and technology aligns with representations of shared understanding outside the school context (Kula and Ternaux 2013). By characterising teacher preparation in this way, textbooks promote mini-boundaries within the subject. Mini-boundaries that create internal differences in relation to aesthetic understanding (Darby 2006) and the potential continuation of subject sub-

culture divisions that have been observed in past iterations of the subject (Penfold 1988, Paechter 1995). Divisions that limit the clarity required to explain the field of integrated knowledge, advocated by Bell et al. (2017).

It is not surprising then that teachers identify themselves as teachers of a material specialism. A specialism that relates to their first-degree, ITE and competencies developed within the workplace. In 2017 the DTassoc. surveyed 379 secondary design and technology teachers (Design and Technology Association unpublished) to identify the aspects of KS3 teaching that teachers felt they were able to teach with confidence, see Figure 11. The survey revealed that just over half of the teachers felt able to teach food and product design; and just under half felt able to confidently teach textiles. This suggests that a significant proportion of teachers have lacked prior opportunities through their teacher preparation course or workplace experience, to teach outside a specialism. Opportunities that might have helped design and technology teachers with the challenges of this current reform (Childs and McNicholl 2007). The survey also revealed low numbers for design and technology teacher confidence in the teaching of electronics, systems and control, and the use of programmable components. Aspects that reflect the modernity of the curriculum and the need for up-to-date knowledge. The types of knowledge expectations and associated practices that have not yet embedded within the subject sub-culture and were criticised in relation to teaching back in 2008 and 2011, by Ofsted (2008, 2011). However, this is not to say that all aspects of the subject repeat the formation of mini-boundaries and limit aesthetic understanding (Darby 2006). This is

because the survey also showed other general aspects of the subject that teachers felt they were able to teach well, including working with contexts, mainly making (Barlex 2012, Barlex and Steeg 2013, Barlex and Steeg 2017, Hardy and Norman 2021) and designing and making, see Figure 12. The aspects that teachers felt most able to teach reflected the 'making', 'designing', 'personalising' and 'manufacturing' eras of design and technology (Martin 2013).

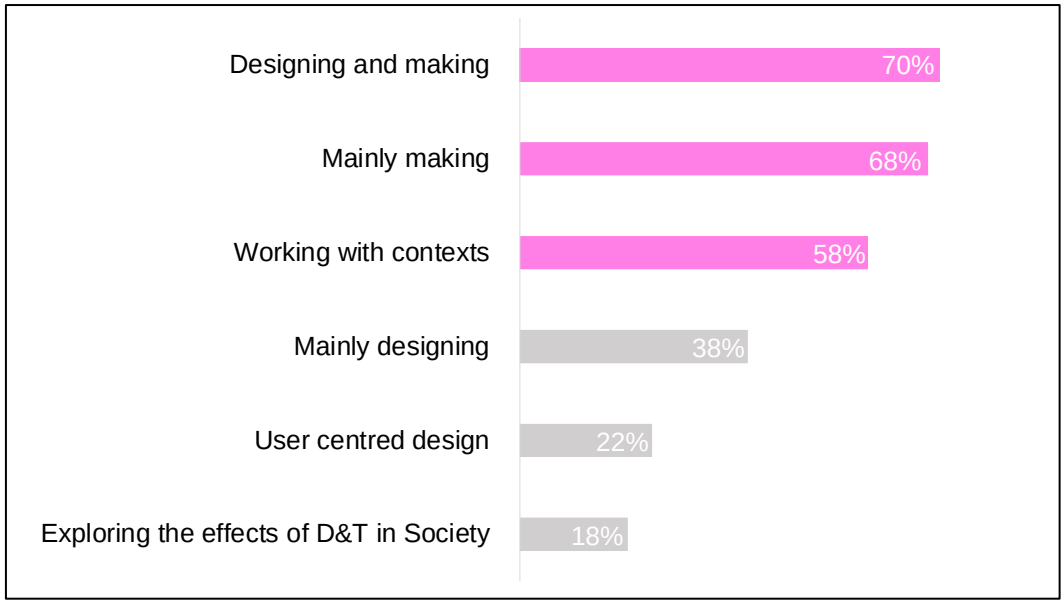


Figure 12: Aspects of KS3 design and technology that teachers feel they are able to teach well – part 2 (Design and Technology Association unpublished).

Subject sub-cultural divisions are not unique to design and technology and have been written about in relation to maths and science teachers (Darby 2006, Childs & McNicholl 2007, Sani & Burghes 2022), physical education teachers (Morgan & Bourke 2008), and primary teachers (Thornton 1995, Chapman, Wright & Pascoe 2018, 2020). The need for teachers to cross subject boundaries and teach outside a specialism is an

issue that involves the crossing of subject boundaries to develop new practices and expectation. The problems associated with crossing subject boundaries can be related to perceptions (Gerretson, Bosnick and Schofield 2008) of difference (Perry and Ball 2004) that challenge curricular and pedagogical identity (Bell, et al. 2017) and lead to a need for teachers to access new learning (Douglas 2011 2014). Darby's research into crossing subject boundaries is useful to this study, in the way that it breaks down the process of crossing boundaries into three progressive stages:

- understanding;
- unification;
- transformation (Darby 2006, p. 55 - 56)

Stages that can potentially grow the language used to speak and think about a subject and develop shared values that help to promote shared beliefs about what the subject ought to or could be.

Research outside the context of design and technology offers valuable insights into how subject boundaries can be crossed. Boundaries link to the subjects teachers have mastered and feel they understand (Shulman 1986). In design and technology, teachers will likely have a more robust understanding of the curriculum aspects related to their first-degree specialism. A specialism initially shapes the teacher’s work and forms a mini-boundary within the subject sub-culture (Penfold 1988, Paechter 1995, Goodson 1998). Research into PGCE teacher preparation learning opportunities by Douglas (2011) suggested greater tolerance for crossing

subject boundaries when student teachers were given opportunities to work outside their initial specialism (the school experience element of their course). These experiences had the potential to support a shared subject understanding (Eteläpelto, Vähäsantanen and Hökkä 2015, Karousiou et al. 2019) through the development of broader (non-subject specialism) competencies and confidence (Morgan and Bourke 2008). Competencies that lead to the understanding and mastery that Buchanan's (2015) research suggested have the potential to support reform developments.

Along with Buchanan, several scholars in this chapter discuss the connections between agency, subject sub-culture and teacher identity formation (Paechter 1996, Day and Kington 2008, Buchanan 2015, Karousiou et al. 2019, Sherman and Teemant 2021). Identity formation is a complex concept that is often perceived to be synonymous with a teacher's role (Britzman 1992). Although the idea of identity and identity formation might potentially have relevance to research around design and technology teachers, Britzman's description of role best suits my study. This is because my main concern is how teachers identify with a material area specialism and how it defines their role within a subject department.

2.4 Summary

This chapter reviewed the limited research into the issues and problems that design and technology teachers face and the different ways they deal with the challenges bought about by policy reforms that change the content, pedagogy and purposes of the subject. The literature review has helped refine the research questions in the light of what others have

written about agency, teacher agency, the subject's history and what the new reform might mean for teachers training and working within design and technology. I have used the literature review to argue for research that focuses on the issues and challenges that influence teachers' approaches to subject change. Leading to the research question:

- what are the specific issues and challenges that design and technology teachers face when translating policy development into practice?

Drawing on the work of Giddens, Priestley, Biesta and Robinson, and Buchanan, I used the literature review to argue for research that supports training teachers (and those working in the subject field) by identifying the influences (past, future and present) that shape teachers' intended actions and work in school. Leading to the research question:

- what professional experiences influence different teacher responses to the challenges a policy development brings to established practice, focusing on teacher agency?

The next chapter explores the methodologies and methods considered to generate data that would help address the three project research questions.

Chapter 3 Research Design

This chapter explains and justifies the approaches and methods used to answer the research questions:

- what are the specific issues and challenges that design and technology teachers face when translating policy development into practice?
- what professional experiences influence different teacher responses to the challenges a policy development brings to established practice, focusing on teacher agency?

The chapter divides into six sections. First, the qualitative paradigm is explained and terms defined. Second, I discuss my epistemological and theoretical perspectives. Third, the phenomenographical research approach is described. The fourth section outlines methods, including sub-sections on participants, interview processes, data analysis, coding procedures, data collection methods, risk factors, and data verification. Fifth, ethical considerations are discussed. Finally, a review of confidentiality and consent is provided. This chapter explores the benefits and limitations of a visual method of description and phenomenographical approaches to analysis within empirical studies about subject change and teachers in secondary design and technology.

3.1 The Qualitative Research Paradigm

Conceptually, the qualitative paradigm is the opposite of the positivist paradigm and is concerned with subjective knowledge and experiences

that are not universal but individual truths (Robson and McCartan 2016). Practically this means that I will be answering my research questions by interpreting personal accounts of experience leading to rich data that is not generalisable but offers insights into the participant groups' accounts of a phenomenon. For this, I am using Creswell and Poth's (2018) definition of qualitative research. They highlight the way that qualitative research comes from assumptions about a research problem and the use of theory to frame that problem and work out what impacts on humans or the social world. They go on to emphasise the nature of qualitative research as a developmental process that draws on inductive and deductive methods. Through data collection in natural settings, qualitative research can be unpredictable leading to an emerging approach that strives to truthfully represent the data. Creswell and Poth sum this up, when they say:

> the final written report or presentation includes the voice of participants, the reflectivity of the researcher, a complex description and interpretation of the problem, and its contribution to the literature or a call for change (Creswell and Poth 2018, p. 8).

For me qualitative research began with an assumption that policy development would cause issues and problems for teachers of secondary design and technology. Agency offered a theoretical frame for the study, but the emerging approach was an initial concern for me as a novice researcher. Therefore, I looked to the phenomenographical literature to guide my data analysis and approach. I adapted Creswell and Poth's (2018, p. 51) phases in the qualitative research process using

phenomenographical stages to guide my study, see Figure 13.

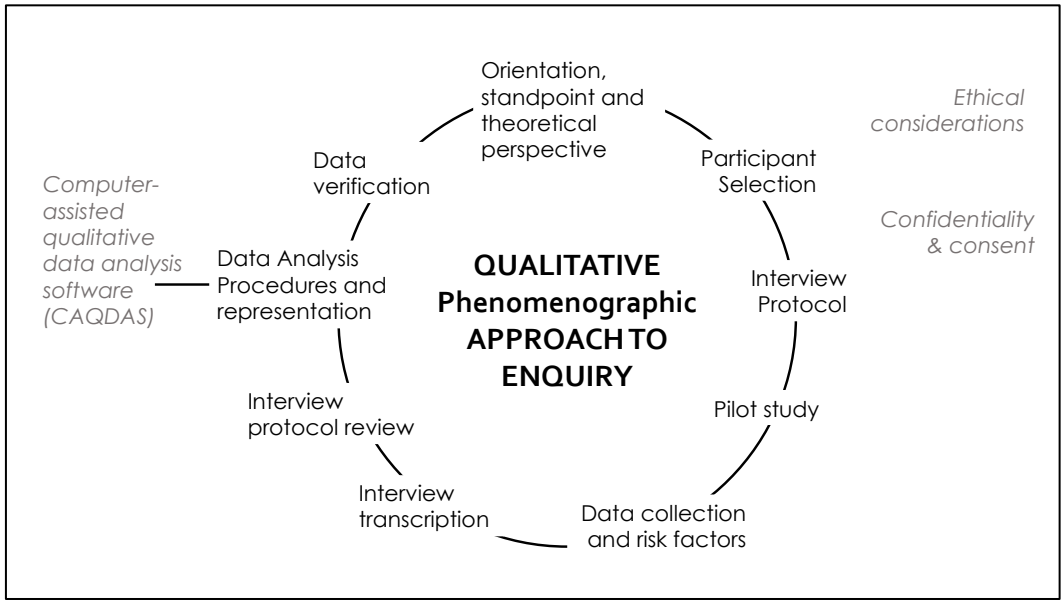


Figure 13: Phemonemographic adaptation of Creswell and Poth's (2018, p. 51) phases in the qualitative research process.

The first part of my approach was to explore my orientation, standpoint and theoretical perspective. Discussing my orientation is a means of recognising what Ashworth and Lucas (2000, p. 300) refer to as an exploratory identification of 'the broad objectives of the research study' and Patrick (2000, p. 129) refers to as 'formulating the phenomenon of interest'. This meant that I needed to be clear about the meaning of the phenomena to me and recognise that my understanding of this area might differ from that of my participant group. As Creswell and Poth (2018, p. 15) suggest, 'we always bring certain beliefs and philosophical assumptions to our research'. Beliefs and philosophical assumptions that express our concerns with existing beliefs. The belief that I wanted to challenge was Miller and McGimpsey's (2011) assertion that design and technology teachers were to blame for the subject's reproduction of

traditional content and methods, demonstrating a certain set of beliefs I held at the start of the project. Beliefs that made me curious and gave rise to the project questions but also that positioned me in a certain way. This questioning of existing beliefs has the effect of 'bracketing' the researcher perspective.

Bracketing Phases (Gearing 2004)	The study
Abstract formulation	Orientation, standpoint, and theoretical perspective (see Section 3.2)
Research praxis	Ongoing throughout data collection and analysis (memo writing and research journal)
Reintegration	Data representation (see Chapter 4 and 5)

Table 2: Applying phenomenographical principles to this study based on Gearing (2004).

Bracketing originates from the development of the phenomenological tradition and has been adopted by qualitative researchers working across other methodologies (Ashworth 1999, Van Manen 2016). The broader adoption of bracketing beyond phenomenological studies has led to different uses within the different approaches leading to a mixture of interpretations (Gearing 2004). For the purposes of this study, I am using bracketing to clarify my own understanding of the phenomena being investigated in this research project so that I recognise how it differs from

that of my participants. Within the phenomenographical tradition Ashworth and Lucas (2000, p. 297) advise that researchers use bracketing throughout the data collection period to support understanding of participants' point of view. A point emphasised by Gearing who defines three phases of bracketing, which can be aligned to this qualitative approach to inquiry, see Table 2.

3.2 Orientation, standpoint and theoretical perspective

Before talking about my epistemological standpoint, I need to consider the ontological orientation of the study. I was prompted to undertake this study as a result of my unease with the teaching of design and technology. The discomfort was associated with my long history of involvement with the subject (see researcher position in Chapter 1). Therefore, I needed to consider how my background and views on the subject might affect the research. Consequently, I needed to analyse my assumptions to gain truths about the topic.

I experienced the subject of design and technology (then called home economics and CDT) as a child through a choice of pathways that included cooking or sewing (home economics). These were the only pathways available to female pupils in my school. Hence, my design and technology experience back in the 1980s would be different from my ITE students' experiences in the present. The participant sample was made up of teachers who attended school between the 1980s and 2000s. Therefore, I cannot assume that all my past ITE students share the same reality of learning design and technology knowledge as myself.

When I became a teacher, I was trained to teach design and technology alongside other trainee teachers with different first-degree specialisms. The course I attended included generic sessions across all areas of the subject and specialist textile sessions for six of the fifteen students. In addition, I attended four sessions on the knowledge and skills required to teach RM. Professional practice placements in two schools supported university sessions where I experienced teaching across material specialisms, including textiles, food technology and RM. My own ITE students arrive at the university with a mixture of first-degree specialisms. They also experience generic design and technology sessions, and until 2013, specialist material sessions. In addition, some students experience a summer Subject Knowledge Enhancement (SKE) course, which offers practical workshops to support subject knowledge development across four material specialisms. Once on the PGCE course all these students experience two professional practice placements and teach across the breadth of design and technology, dependent on the experiences offered at the placement school. This means that my students arrive on an ITE course with various first-degree specialisms and experience a different version of ITE and often a very different professional practice placement experience to myself and each other. Therefore, I cannot assume that all my past ITE students share my reality of learning to teach design and technology.

On graduating from my ITE course, in 1997, I started working in a large design and technology department at a local authority comprehensive school. The department divided the KS3 curriculum into material specific

projects that reflected GCSE pathways, at the time (food technology, textile technology, resistant materials technology, electronic product and graphic design). The department structured curriculum through short design and make projects covering generic knowledge and skills related to the material context. Design decisions were limited to the colour of fabrics and the choice of embellishment. This type of curriculum model has been criticised as repetitive (Ofsted 2008, Ofsted 2011). My ITE teachers graduate from university and take up teaching positions in various schools, including academies, free schools, private schools and local authority schools. They teach a different policy iteration of the curriculum to the one I taught. Again, I cannot assume that all my past ITE students share the same reality of teaching design and technology as myself.

Writing about my assumptions highlights my orientation to qualitative research. I believe that the nature of how teachers find, understand and practice the subject change can only be understood through the reporting of different perspectives. Creswell and Poth (2018) explain that reality is multiple and individual teachers will have differing views dependent on their experiences and conceptions of subject change over time. Time-related experiences and conceptions that align with my qualitative standpoint and use of a theoretical frame of agency (see Chapter 2).

To understand the multiple views of my participants, I needed to investigate secondary design and technology subjective experiences by taking the recommendation of Creswell and Poth (2018, p. 21) to conduct

my study, ‘in the field’. Collecting data about the teachers' subjective experiences of finding, understanding and practising the subject change will be better understood within the participants' context – where they work. I know I may already occupy an insider position due to my previous relationship with the participants (students from my university that I taught to a lesser or greater extent during their ITE). However, forms of data collection that encourage a sense of objectivity, such as questionnaires, will not support my aims, and the decision to generate data in the field will, as Cresswell and Poth (2018, p. 20) assert, ‘lessen the distance between the researcher and that being researched’.

I bring a set of values to the study about the subject change and the role of teachers. I am passionate about design and technology and see it as a vehicle for developing 21st century skills (UNESCO 2014, Davies and Hail 2015). I believe that practical education is vital alongside knowledge of the material world to develop knowledge and skills in learners that empower them to act on and in the world. This desire is echoed in the populist book, by Crawford (2010), *The Case for Working with Your Hands or Why Office Work is Bad for Us and Fixing Things Feels Good*. Crawford implores his readers to reconsider the importance of developing manual skills to understand the ‘stuff’ we own and our decisions about using it. Knowledge of the ‘stuff’ we own, I believe, empowers pupils to gain a better understanding of technology. Pulitzer Prize-winning journalist Thomas L Friedman (2016) persuades his readers to invest in a better understanding of technology, alongside globalisation, the effects of climate change and biodiversity loss. He suggests that this better

understanding may alleviate the fear that young people (and adults alike) feel as the reshaping of our world is accelerated through new technologies. These viewpoints shape my values around educating young people about the technologies that impact our communities, workplaces and culture. On reflection this means that my perspective could be traced to my own era of teaching design and technology - ‘valuing’ (Martin 2013). However, as a teacher educator working within design and technology, I have become increasingly dissatisfied with my student teachers’ experiences of versions of the design and technology curriculum that fail to present authentic learning (Turnbull 2002) and develop creativity (Nicholl, et al. 2013). Student teachers often enact lessons that focus on producing material objects that, for example, claim to develop an understanding of the diverse historical and cultural reasons for design but instead promote an uncritical imitation of their aesthetic characteristics, which Ofsted (2011) identifies as poor design and technology. This curriculum is not too dissimilar to the reality of my own ITE teaching experiences some twenty-two years ago. This kind of curriculum restricts learners to know how an aesthetic characteristic can be imitated at the expense of knowing that aesthetic characteristics signify the material object's economic, cultural and historical context (Craft 2005). HMI Diana Choulerton (2015a) echoed similar observations about the subject’s enactment on a national scale at the DTassoc. Summer School. I agree with her when she says that teaching in design and technology needs to balance propositional and practical disciplinary knowledge learning. When I visit schools, I observe a greater emphasis on practical lessons.

However, I have questions about why this is, and if teachers learn one idea about the nature of the subject during ITE courses what then promotes or does not promote behaviours that support this type of teaching once they move to a design and technology subject department?

3.3 The Phenomenographical Approach

Creswell and Poth (2018, p. 21) advise that qualitative methods are ‘inductive, emerging and shaped by the researcher's experiences of collecting and analysing the data’. Whilst I wanted to remain true to Creswell and Poth’s idea that research methods ought to emerge and shape the research from the ground up (inductive), I needed a methodological framework to scaffold my developing skills. Therefore, I needed an approach, and as Denscombe (2017, p. 3), emphasises a ‘strategy’. The strategy I chose to draw on was phenomenography. Phenomenography is a qualitative research method that developed the phenomenological approach to answer questions about teaching and learning, particularly in educational research. It is similar but distinct from phenomenology concerning rules of interviewing and the overall aim of describing a phenomenon. According to Barnard, McCosker and Gerber (1999, p. 213), both phenomenography and phenomenology, ‘aim to reveal human experience and awareness as an object’. However, phenomenography is less interested in individual experience than collective experience (Marton 1981, 1986, Bowden 2000, Trigwell 2006). Phenomenographic descriptions move from explanation of how something is to how it is understood (Barnard, McCosker and Gerber 1999). An

understanding that leads to a level of description that aims to conceptualise the limited ways a phenomenon is understood.

	WHAT	HOW
Marton (1986)	Phenomenon as experienced	Phenomenon as conceptualised, perceived, understood
Creswell and Poth (2018)	Textual description	Structural description
Bowden (2000)	What participants are doing	[...] to make meaning of phenomenon
This project	Practical focus	Frame of reference

Table 3: Types of qualitative description (Marton 1986, Creswell and Poth 2018, Bowden 2000).

Marton (1986), one of the founding figures of the phenomenographic approach, developed the method from a desire to describe and categorise the different ways that students approached learning. In his own words, Marton defines phenomenography as:

> a research method adapted for mapping the qualitatively different ways in which people experience, conceptualise, perceive, and understand various aspects of, and phenomena in the world around them (Marton 1986, p. 31).

I was drawn to Marton's approach because of his orientation to education and teaching and the fact that other phenomenographers including Bowden (2000, p. 9) describe the approach as a method that ‘mirrors what good teachers do’. This is because it sets out to understand what the

participants (a proxy for students) are doing to make meaning of a phenomenon (a representative for learning). Moreover, the approach supports my need to discover participants' different approaches to a social situation. In my case, an investigation into how teachers translate policy reforms into their day-to-day practice, see Table 3.

However, I wanted to understand both the teachers' individual and collective experiences of subject change as a mechanism for developing a set of tools that can be used to support future teacher reflection on the experiences of colleagues working in the field (see Chapter 1 – research aims and objectives). This goes against some phenomenography philosophy of the approach, for example, Trigwell (2006, p. 368) asserts that:

> [t]he essence of the phenomenographic research approach is that it takes a relational (or non-dualist) qualitative, second-order perspective, that it aims to describe the key aspects of the variation of the collective experience of a phenomenon rather than the richness of individual experiences, and that it yields a limited number of internally related, hierarchical categories of description of the variation (Trigwell 2006, p. 368).

In other words, conceptions of a phenomenon – ideas about subject change - are viewed as the product of an interaction between humans and the world around them. This aligns with Priestley, Biesta and Robinson's (2015) definition of teacher agency as relational to the social structures of school and warrants my use of teacher agency as a lens for data analysis

and later discussion (see Chapter 5 and 6). By describing the common perceptions of a phenomenon across participants, the approach aims to result in a hierarchical typology of statements that categorise the description into a set of statements that describe the qualitatively different ways that teachers' experience and conceptualise the phenomenon of teaching a policy reform. In my project, I aim to conceptualise each teachers' actions in turn. As such, detailed descriptions of the individuals in the group are not typically included in phenomenographic studies. However, when I was researching the phenomenographical literature to support my developing understanding of how to apply this approach to my project, I was introduced to a paper by Ashworth and Lucas (2000) that set out to offer a practical approach to design, conduct and reporting of this type of study. The paper advocates the production of three kinds of findings: (1) individual profiles, (2) collective themes, and (3) categories of description to support detailed descriptions of the lifeworld of participants. The above discussion supported my choice of a qualitative and interpretive methodology that applied phenomenographical strategies to focus on and make sense of what the teachers in my study said.

3.4 Research Methods

Having provided a rationale for selecting a qualitative approach that draws on phenomenographical strategies, I use the following section to discuss the methods chosen to generate data, and to consider the factors that will determine the sample of participants. The purpose of this section of the chapter is to argue that my data collection and analysis procedures are

reliable and that I have considered appropriate questions of ethics.

3.4.1 Participant Selection

In accepting that phenomenographic research aims to identify the variation of experiences within a group, a samples was chosen to maximise the possible interpretation.

My choice of a purposive (Cohen, Manion and Morrison 2011, Robson and McCartan 2016) multiple case (Creswell and Poth 2018) design led to a sample of 12 teachers that graduated from one English university-based initial teacher education (ITE) course (the researcher's own). These teachers met my research interest in that they were teaching either KS3, and or KS4 (or both) design and technology during the data collection period. Apart from these two variables, the sample offered a diverse range of qualitative differences across cases. Through my sample, I collected data about a range of experiences to give me descriptions of in-depth knowledge of what Ashwin and Lucas (2000) refer to as different lifeworlds. When I initially planned the sample, I aimed to develop a typology (Schulhoff 2000 p. 446-7, in Silverman 2013) of design and technology teachers that would cover common sense variables like gender identity (Killerman 2018), the period spent in the job and work setting. However, further reading of Ashworth and Lucas (2000) influenced my desire to keep an open mind and not predict the variables that might affect a participants' meaning of the phenomenon. The idea of keeping an open mind about sample typology was due to evidence from Ashworth and Lucas's study, which highlighted how the participants'

particular experiences can lead to further understanding about the variables influencing design and technology teachers' context. For example, after completing my second interview, I became interested in the link between a teachers' experience of working across different schools (compared to just one) and their understanding of policy developments leading to changes in practice. This not only justified my choice of multiple case to capture 'multiple stories' (Creswell and Poth 2018, p. 53) but the focus on keeping an open mind empowered me to add an additional demographic question to my interview protocol about the amount of schools the teachers had worked in (see appendix item 12).

3.4.2 Interview Protocol

The phenomenographic research interview recognises that the meaning of the phenomena under investigation may be understood in quite different ways by the study subjects. I have been guided in this approach, through a paper I read 'Achieving Empathy and Engagement: A practical approach to the design, conduct and reporting of phenomenographic research' by Ashworth and Lucas (2000). They advocate for researcher caution when identifying the broad objectives of their study and remaining neutral during the participants' telling of their experience so as not to influence the outcome. Therefore, interview questions need to encourage an open conversation that explores the individuals' day-to-day experiences of design and technology teaching. Continuing to take advice from Ashworth and Lucas, I chose to use in-depth interviews as a mechanism for allowing my research participants to describe their

experiences with maximum freedom. The use of in-depth interviews allowed me to gather data about the phenomenon under study as experienced by the multiple participants of my research. Various scholars define the in-depth interview as a conversation between two people (Silverman 2015, Robson and McCartan 2016, Creswell and Poth 2018). A conversation to elicit information, supplied by the interviewee subjects, about their experiences of the phenomenon. The interview is popular within qualitative research methods, and the fact that the technique allows researchers to generate data directly from the subjects of the study provides legitimacy. Validity is established because the researcher initiates the interview conversation for the specific purpose of compiling information that only the subject of study can provide, and therefore, 'data are reasonably likely to be accurate and appropriate' (Denscombe 2017, p. 326). The conversational nature is helpful because the researcher makes an effort to understand the view of the subject of the phenomenon, and to quote Cohen, Manion and Morrison (2011p. 409), they 'press not only for complete answers but for responses about complex and deep issues'. I strove to gather empirical data from my multiple participants about their individual experiences of teaching design and technology, which they revealed through the in-depth nature of the interview conversation.

For my in-depth interviews, I chose a semi-structured format to guide the approach. I drew on the work of Foddy (1993) and Kvale (1996), who define their versions of a semi-structured interview as a set of minimal open-ended questions and a set of prompts. The open-ended nature of

the questions allowed the participants to reflect and ‘elaborate, provide incidents, clarifications and, maybe, to discuss events at length’ (Ashworth and Lucas 2000, p. 302). I used the semi-structured format to scaffold the themes of the open-ended questions and guide the conversation to generate organised data across the different respondents (Cohen et al., 2011). I was keen to draw on Ashworth and Lucas to generate a ‘conversational partnership’ that would assist my participants in the process of reflection on the interview themes. However, I was aware that my role as the interviewer might impose on the interview because of my previous relationship as an ITE tutor. For that reason, I followed advice from the phenomenography works of literature about ‘bracketing’ (Ashworth 1999). I used a research journal (Moon 2006) to ‘consciously silence’ my ‘concerns, preoccupations and judgements’ (Ashworth and Lucas 2000, p. 303) as a mechanism to avoid value judgements.

The interview protocol supported my desire to have a systematic approach to the interviews by focusing the teachers’ talk around specific areas of interest. The protocol was developed over several iterations. First, an initial outline of questions was presented to the ethics committee (see Appendix item 4). Next, the interview questions were developed. Finally, the interview guide was agreed with my supervisors. The guide included demographic and open-ended possible and follow-up questions to choose from (see Appendix item 12). I designed open-ended questions to elicit teaching experiences, professional learning, and participants' meaning about disciplinary content. To further spur the conversations and encourage participants to reflect on curriculum change issues within their

lifeworld, I drew on Kvale's (1996, p. 133 - 135) types of interview questions to develop the following prompts:

- Tell me more about that (why)?
- I am curious about that change ...
- And then?
- And …?
- Can you tell me more?
- Can you give an example?
- Go on ...
- Really?
- Can you say something more? (see Appendix item 12).

A phenomenographic interview will give me the empirical data that describes the teachers' experiences and offers an understanding of the limited ways that teachers experience and conceptualise the various aspects of translating policy into practice. The following section will recount how I went about collecting the data.

3.4.2.i Piloting

As part of the research design I undertook a piloting phase, see Figure 13, to validate the interview protocol. The pilot study included three preliminary interviews to test three elements of the research design: 'technical matters', 'questions' and 'pre-piloting' categories (Cohen, Manion and Morrison 2011p. 118):

- Technical Matters: the pilot study confirmed the interview timescale

and the need to consider interview room layouts and ways to ensure that my participants were comfortable to freely discuss their experiences at length (Ashworth and Lucas 2000). The pilot study highlighted the difficulty of managing over-long protocol sheets needed to guide interview questions and issues related to recording equipment. Specifically, the matter of recording equipment position and set up.

- Questions: the pilot phase helped me to see how participants might respond to my questions. For example, during the second pilot interview, I asked my pilot subject about their work environment experience and how it influenced their practice. I had designed specific questions to uncover the structures behind a practice – how the norms within the department and principles of curriculum delivery influenced the topic under discussion. One pilot subject struggled to answer the question posed and asked for clarification. I reworded the phrase ‘can you tell me about how you and/or the team went about deciding on what gets taught?’ to ‘tell me about the nuts and bolts of the situation’ (see Appendix item 12), which led to greater detail in their answer. This additional question helped me to develop my prompt questions (Kvale 1996).
- Pre-piloting: testing the pilot interviews bought to light the extent of data that the in-depth interviews would be likely to generate, which led to further research into transcription services and data management software (see Section 3.4.ii and 3.4.5). At this stage I generated the following pilot categories to support early analysis:

- assessment;
- change;
- culture;
- curriculum;
- disciplinary content;
- goals;
- pedagogy;
- professional history;
- resources.

Working through this process validated my data collection method and refined my research design. In addition, this process led to creating an interview protocol checklist to ensure consistency, the rewording of specific interview questions and a realistic plan for interview transcription. Data from the pilot study was not used in the main study.

3.4.3 Data Collection

Once I had the interview protocol and ethical approval, I started my data collection (my ethical process will be discussed fully in section 3.5). The data was collected over eight months at each teacher's place of work either physically face to face or via a video link phone call (Skype for Business). Teachers were reluctant to be interviewed during the pre-examination months (April and May), resulting in a break in data collection, see Figure 14. The initial aim to interview all participants at their physical place of work proved problematic during the summer term. To accommodate the later interviews, I adapted the participant interviews

to include the use of video link phone calls (Skype for Business). This strategy enabled me to conclude all 12 interviews within the study parameters. To support consistency all video link phone call interviews were conducted during the school day. Interviews during the school day supported the study aim to complete research interviews in the participants' setting (Creswell and Poth 2018).

Finally, I drew the data collection period to an end for pragmatic reasons. My capacity to generate data was dependent on one academic year timetable, and I felt I had reached a good point by the twelfth interview. I reflected that the generated data revealed common experiences and appeared to yield no new data.

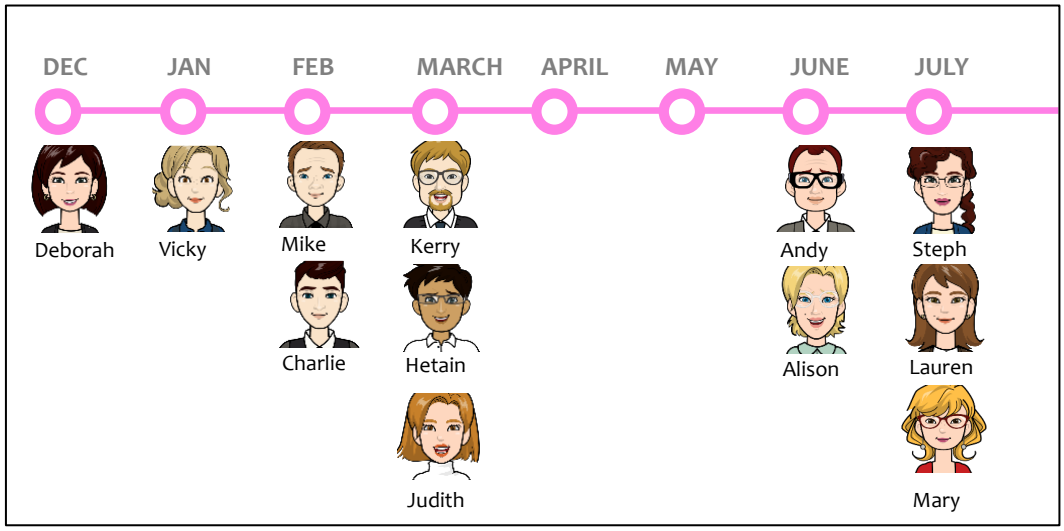


Figure 14: Timeline of interview schedule.

3.4.3.i Risk Factors

Many data generation methods including observations, writings, drawings, and interviews reveal a person's understanding or conception of a particular phenomenon. However, phenomenographers favour interviews because they are an accessible way for participants to share

their perceptions of a phenomenon. When choosing to use interview or any other research method, it is often a case of trade-offs. The interview will give me the type of rich data I need to understand what matters to the participants. However, the trade-off can be a loss of control and the generation of large amounts of data that make analysis processes complex. I evaluated the strengths and weaknesses of using phenomenographical strategies in this qualitative study, see Table 4. The use of phenomenography supported my qualitative orientation and had been used by other researchers to generate data about practice (Bowden, 1986, Prosser 1994, Lucas 1998, Trigwell 2006). However, the evaluation also identified a need to draw on other research literature to support the analysis process due to a lack of concrete guidance around the researchers need to empathise with their interviewee and the analytical process (beyond its relation to grounded theory (Richardson 1999, Trigwell 2006). In addition, the evaluation confirmed the use of my teacher agency framework (see Chapter 2) to expand definitions beyond phenomena and towards an individual participant group - design and technology teachers.

Strengths	Weaknesses
Evidence of research process (Sandbergh 1997, Ashworth and Lucas 2000, Patrick 2000, Barnard, McCosker and Gerber	Lack of concrete guidance about the ways a researcher might ‘retain the participants’ language in a descriptive form, with emphasis that presents to the reader the

1999);	meaning of the interviewee' (Barnard, McCosker and Gerber 1999, p. 223);
The analysis method generates knowledge of the limited ways that a phenomenon is experienced and conceptualised through categorisation (Barnard, McCosker and Gerber 1999);	'[A]bsence of published guidance on the analytic procedures that were involved in "doing phenomenography"' (Richardson 1999, p. 71);
'Generative of new insights into the relations between teaching and learning' (Patrick 2000, p. 134);	Cannot see change over time Patrick (2000);
Qualitative and interpretative Patrick (2000). Emphasises 'collective meaning' (Barnard, McCosker and Gerber 1999, p. 213).	Less important to be valid and reliable (Patrick 2000, p. 134).

Table 4: An analysis of phenomenographical research strengths and weaknesses.

3.4.3.ii Transcription

To support data analysis the recorded interview data were converted from audio files to written text. I followed Gibbs' (2012) advice and transcribed

the recordings, whilst remaining mindful that during the transcription process a written text might lose sight of the hesitations and garbled comments afforded by a cleaned-up script. To counteract this, Gibbs suggests a three-level process that I applied over the year of data collection. The first level of transcription required a careful listen to the full recording to identify a table of contents, representing the main practice focus and order, discussed in the interview. The second level of transcription involved the making of a rough transcript that records the verbatim interview and ignores spelling and punctuation. Finally, the third level of transcription required the transcriber to make a full and accurate transcription, adjusting spelling and punctuation from stage two. Gibbs warns that although the process is time consuming and the potential nuances of sound can be lost, the benefits of having a written text to mull over, annotate and use with data analysis software (see Section 3.4.5) is appealing.

All three levels require an amount of time to complete and after the first three interview recordings were transcribed I moved to an approved transcription service. To ensure consistency, I drew on Cohen, Manion and Morrison's (2011, p. 537 - 538) suggested conventions to develop 11 protocols for use across all transcriptions (see Appendix item 13). In the protocol, I identified how to make a note of anything likely to affect my understanding of the participants' meaning (Ashworth and Lucas 2000, p. 304).

3.4.3.iii Interview protocol review

Interview skills have been paramount to the success of the data collection stage. I took Ashworth and Lucas's (2000p. 303) advice to build ongoing review procedures into the interview stage of the project. The early review was critical because of the heavy demands on the phenomenographic interview as the primary data source for the project. I wanted to be vigilant in my practice especially as I wanted to capture the voice of my participants (Creswell and Poth 2018). Therefore, I needed to be open to necessary changes that support the ongoing nature of my interviewing development. It was important for me to develop interview practices in ways that did 'justice to the subjects' stories' and conveyed 'new and valid knowledge and insights' through the re-telling of experiences (Kvale 1996, p. 80).

With this in mind, I took the advice given above and after the first three interviews I undertook an analysis of the interview process. I did this by enquiring about:

- questions asked from the prompt list;
- questions asked as a follow-up to what the individual had said; and
- confirmatory responses or expression of interest.

During the first three interviews, the analysis of my conduct allowed me to reflect on and identify what was working for my participants and what was not (Ashworth and Lucas 2000). I needed to check that the phenomenographical interview was meeting the aim of capturing my participants' accounts of their intended actions towards the subject

change. I did this through the interview conversation, which allowed the interviewee to reflect on their experiences, then relate those experiences to me (the interviewer). During this process the interviewer and interviewee come to a mutual understanding about the meanings of the experiences (or the participants' accounts of the experiences).

For example, when interviewing one participant (Hetain), he struggled to answer one of my questions. My use of prompts failed to return this subject to a more relevant line of dialogue. After the interview, I reviewed how I had started to feel frustrated with this participant's answers because I felt that they did not hear my question. Yet, they still provided conversation about the themes of the interview. The conversation made me realise that I needed to think through why they did not hear my question. I also needed to consider how they made the 'meanings, interpretations and understandings' (Ashworth and Lucas 2000, p. 302-303) about curriculum, policy change, and their role in subject development issues within their lifeworld. This led me to allocate additional time pre-interview to conduct a detailed review of the interview protocol. As a part-time researcher I needed to bracket (Gearing 2004) my day-job from the interview and build in transition time to support a full focus on the participant and upcoming interview.

3.4.4 Data Analysis Procedures

This section describes the analysis process used throughout the study. A creative (Kara 2015) approach to data analysis was adopted that combined phenomenography (Ashworth and Lucas 2000, Sandbergh

1997, Patrick 2000) with two others: Soft System Methodology (SSM) and thematic coding, see Figure 15. I did this because the phenomenographical literatures lacked concrete guidance around specific aspects of the research process (see Table 3), therefore, I needed a scaffold to support my approach. A framework that would allow the study to emerge from the data upwards (Creswell and Poth 2018) whilst encompassing the three kinds of findings advocated by Ashworth and Lucas (2000). The following paragraph clarifies the three stages that make up the creative data analysis framework used throughout the study.

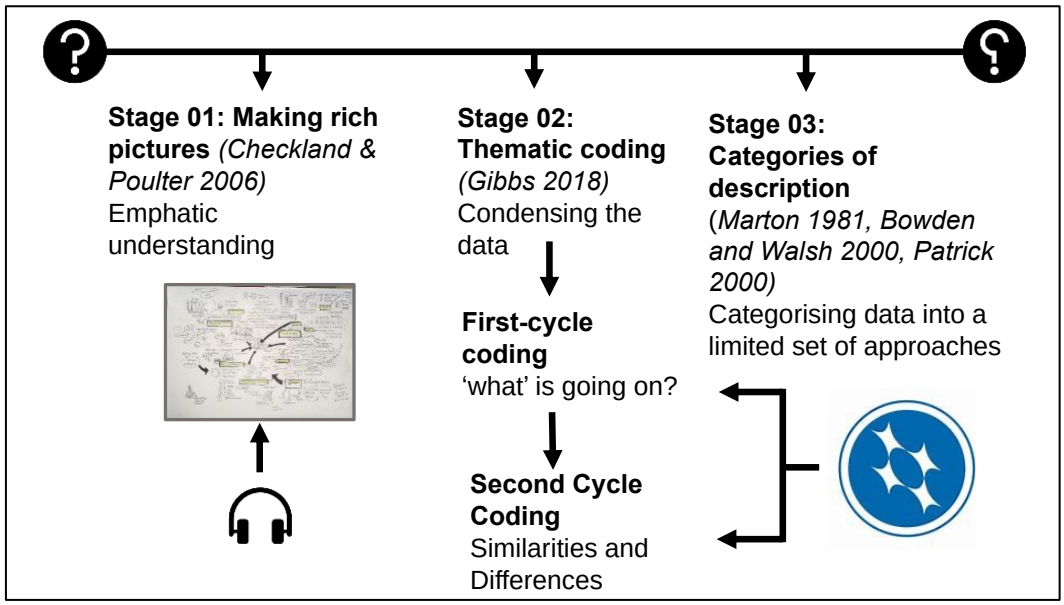


Figure 15: A three-stage creative data analysis framework.

First, an aspect of SSM (Checkland and Poulter 2006) was adopted during stage one of the analysis process to enhance the 'emphatic understanding of participants lifeworlds' (Ashworth and Lucas 2000, p 300) and produce the individual profiles. Then, thematic coding and categorisation (Gibbs 2018) were employed in stage two of the analysis process to supplement the phenomenographical method by giving

structure to the identification of similarities and differences within the data. Finally, the phenomenographic way of attributing a limited set of hierarchical categories to the data completed stage three. All three stages represented different phenomenographical analyses that combined to add integrity to the study (Ashworth and Lucas 1998), and remained true to my qualitative and interpretive methodology that aimed to capture individual stories (Creswell and Poth 2018).

3.4.4.i Making rich pictures

Stage one drew on the aspect of SSM called ‘making rich pictures’ (Checkland and Poulter 2006, p. 24) to scaffold the first stage of the analysis. SSM is a form of action research that practitioners, teachers and students use to improve problematic situations. Through structured activities, researchers discover a problem and build visual models to understand the complex situations under investigation. An SSM investigation typically includes a pattern of four activities. However, I am only interested in the first stage, which Checkland and Poulter (2006, p. 23) refer to as ‘finding out’ because my study is exploratory rather than focused on a solution (the purpose of action research). I was drawn to this approach because the ‘finding out’ stage involved the making of rich pictures to visually model participants’ broader context and world view. I interpreted this as the creation of visual sketches that described each interview in words and pictures, see Figure 16. Rich pictures are created at the start of analysis to bring the researcher (an outsider) into the participants' lifeworld (insider). I was attracted to this creative method of analysis because Checkland and Poulter (2006, p. 25) claim that pictures

are a better medium for representing relationships because they show the ‘complexity of human situations’, which are always ‘one of multiple interacting relationships’. Describing the teachers' accounts, in this way, enabled me to focus on the description and avoid explaining or interpreting the data too early. I wanted to treat all data equally (Sandbergh 1997) and avoid explaining at this stage. I was aware that it is impossible to achieve total closure in qualitative research, and I wanted to bring my emphatic understanding (Ashworth and Lucas 2000) to the study. This understanding came through my privileged position and knowledge as a design and technology specialist educator. The pictures were a way for me to apply this understanding whilst keeping myself focussed on my participants’ meaning of the phenomenon.

The first stage (making rich pictures) concerned four steps. The first step involved listening to the interview tape and making a rich drawing of the teacher’s account of their experience of the subject change. The original interview audio tapes were used for this part of the process (rather than the written transcription text). The second step happened during the generation of the pictures, where I drew on the categories identified in the pre-piloting test (see Section 3.4.2.i) to structure my rich picture, see Figure 18. The use of arrows and categories from the pre-piloting test allowed me to relate focus areas to one another within the intricacy of the teachers' situation (Checkland and Poulter 2006). The third step was completed after the drawing was finished. In this step, I started to interpret the description within my rich pictures by highlighting (green) the statements that appeared significant, to me (because they appeared

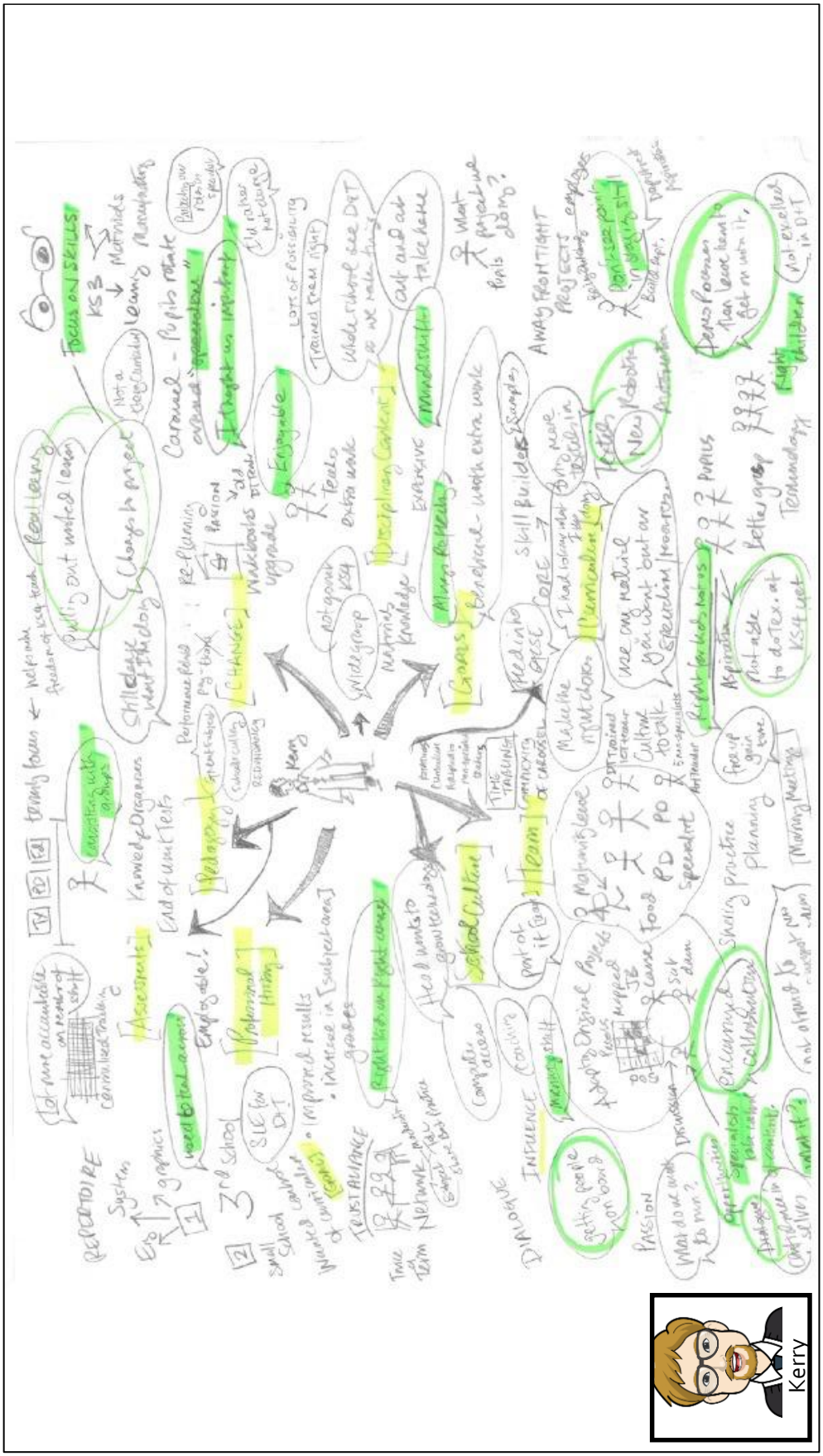


Figure 16: Rich Picture Example – Kerry.

significant to the participants) by using arrows to make connections between drawings and statements, see Figure 16.

The fourth step involved writing a composite description of the phenomenon (Creswell and Poth 2018) using rich pictures. Each vignette (Kara 2015) captures the teachers' contexts and experiences, and conceptualisations of the subject development and change. The resulting combination of rich picture and vignette generated a set of individual design and technology teacher profiles. The profiles are important because they provide internal validation as the researcher progresses to the next stage. In addition, three of the profiles were shared with the relevant teachers to provided further validity to the study. The following section explains how I moved my analysis from the individual to themes across and within cases.

3.4.4.ii Thematic coding

Stage two involved the identification of two types of themes within the collective data. First, Cresswell and Poth's (2018, p. 201) description of 'what' the participants in the study experienced with the phenomenon, which forms a 'textual description'. Second, the description of 'how' the experience happened, which they call a 'structural description'. To support this analysis stage, I drew on thematic coding and categorisation guidance from Gibbs (2018) and Saldaña (2013) whilst moving from hand-coding methods to computer-assisted methods and back to hand methods. I discuss my use of the computer-assisted qualitative data analysis software (CAQDAS), see Section 3.4.5. Thematic coding and

categorisation is a method of condensing data into a set of codes. Codes that represent what your data is about. ‘What’ the participants in the study experienced with subject development. For example, the issues and challenges that arose as a consequence of subject development changes, and ‘how’ the experience happened, how the problem occurred, took shape, or was dealt with, in the confines of the participants' situation. The process of coding is cyclical and works through various stages, levels and iterations. I was mindful of Saldaña’s (2013, p. 58) insistence that ‘data are not coded [...] they’re recoded’ when working through my own iterations. Therefore, I remained mindful that the literatures would offer some guidance during my coding and analysis but the process would be iterative due to the unique nature of any study. I was aware that no book could explain the specific way to code the data, only to direct my approach towards the best fit - the best fit between what I wanted to achieve and how the guidance would help me get there based on my reading and interpretation of the literature.

The next stage involved two steps: first-cycle coding and second-cycle coding. The first-cycle coding step included two aspects (1) identifying the phenomenon ‘practice focus: practical-evaluative dimension of agency’ and (2) identifying the ‘frame of reference: iterational and projective dimension of agency’, see page Table 3. The first aspect involved sorting the data into chunks of text that described different phenomena, which the teachers ‘focus’ on when telling me what they did. Thus, my initial coding framework combined guidance from Gibbs (2018, p. 47) about types of phenomenon that researchers usually code and the ‘focus’ or ‘emphasis

of utterance' that guides phenomenographers. The second aspect involved sorting the data into chunks of text that covered different types of phenomena, which described the teachers 'frame of reference' when telling me about the factors that influenced what they did. Again, I drew on Gibbs coding types to guide my coding framework, see Table 5. I adapted Gibbs guidance on phenomenon types to code chunks of text as linked to conversations about either the participants' practice focus – when discussing what they were doing, or their frame of reference – when discussing the reasons, feelings, understandings behind a practice focus action. By doing this I was able to connect Gibbs advice on thematic analysis to my phenomenographical approach and desire to describe the collective experiences of my participants (Ashworth and Lucas 2000).

	Phenomenographical Research themes	
Gibbs (2012) Phenomenon Types	**Practice focus (What?)**	**Frame of reference (How?)**
	Specific acts, behaviours Events Activities Strategies, practices or tactics Relationships or Interaction	States Meanings Participation Conditions or constraint Consequences

Table 5: Mapping phenomenographical themes to Gibbs (2012, p. 47)

phenomenon types.

The headings in Table 5 were used to design my initial coding framework because they helped me map the different types of the phenomenon to my research interests and questions. Each chunk of text was allocated a code and I drew on the work of Charmaz (2014, p. 168 - 170) and Gibbs (2018, p. 30-32) about memo writing as a way to help think about the emerging data, see Figure 17 and 18. The memos directed my thinking and I used the following questions in Charmaz's chapter to scaffold my comments and start the process of theorising my data, whilst remaining mindful of my phenomenographical approach:

- What is going on? - practice focus;
- What are people doing? -practice focus;
- What is the person saying? - practice focus;
- What do these actions and statements take for granted? - frame of reference;
- How do structures and contexts serve to support, validate, impede or change these actions and statements? - frame of reference (Charmaz 2014, p. 169).

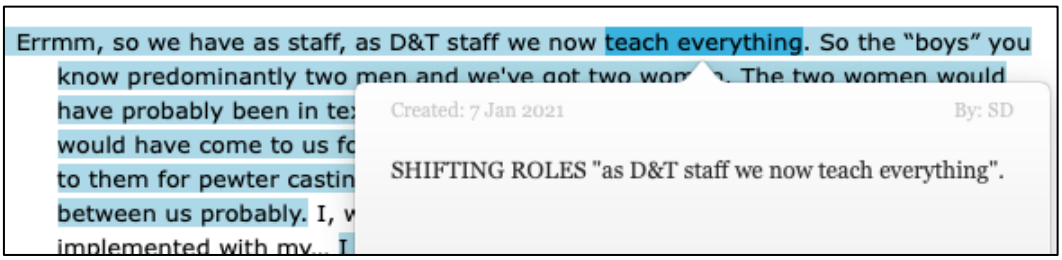


Figure 17: Example memo – thinking through questions about what is going on? and what are people saying?

The questions and resulting memos supported my interpretation and scaffolded the move from description to theories that helped conceptualise the meaning of chunks of text. I was able to chunk the text in ways that exemplified the different ways that teachers find (states, meanings), understand (acts, behaviours, strategies, practices, or tactics) and practice (events, activities, participation) a subject development and change. I also chunked the text that exemplified how teachers responded to the subject development and change (relationships or interactions, conditions or constraints, consequences and settings). This step resulted in 116 codes (see Appendix item 1 for first-cycle codes) mapped to Gibbs (2018) phenomenon types.

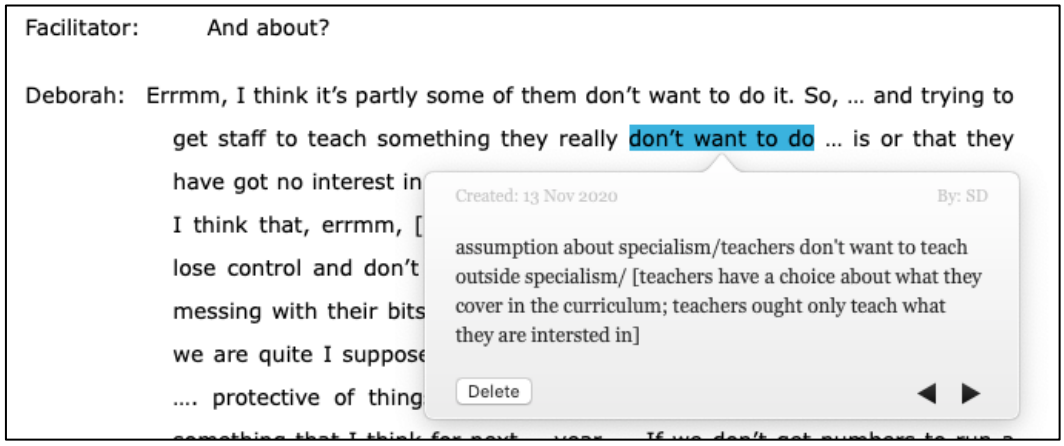


Figure 18: Example memo - thinking through questions about what do these statements take for granted?

The second step involved checking the fit of the chunks of text to my descriptions. Patrick (2000, p. 130) advises researchers to build plenty of opportunities to 'access the fit between individual responses and my [the researchers] description of the groupings'. After each coding session, I compared codes against the description and moved code groups

accordingly (see Appendix item 2 for example description and codes). Step three involved developing coding hierarchies by gathering codes about the same thing - ‘how’ the experience happened. Saldaña (2013, p. 157 – 163) describes this process as a ‘second-coding method’ called ‘domain and taxonomic coding’. I was attracted to this form of second coding because it allowed me to understand the teachers’ view of the world and use theory to form relationships between the codes, see Figure 19.

Stage two resulted in a set of themes that described the practice focus and frame of reference collectively experienced by these participants. The themes provided answers to the studies research questions. The following section explains how I moved my analysis from across and within case themes to a group of hierarchical categories.

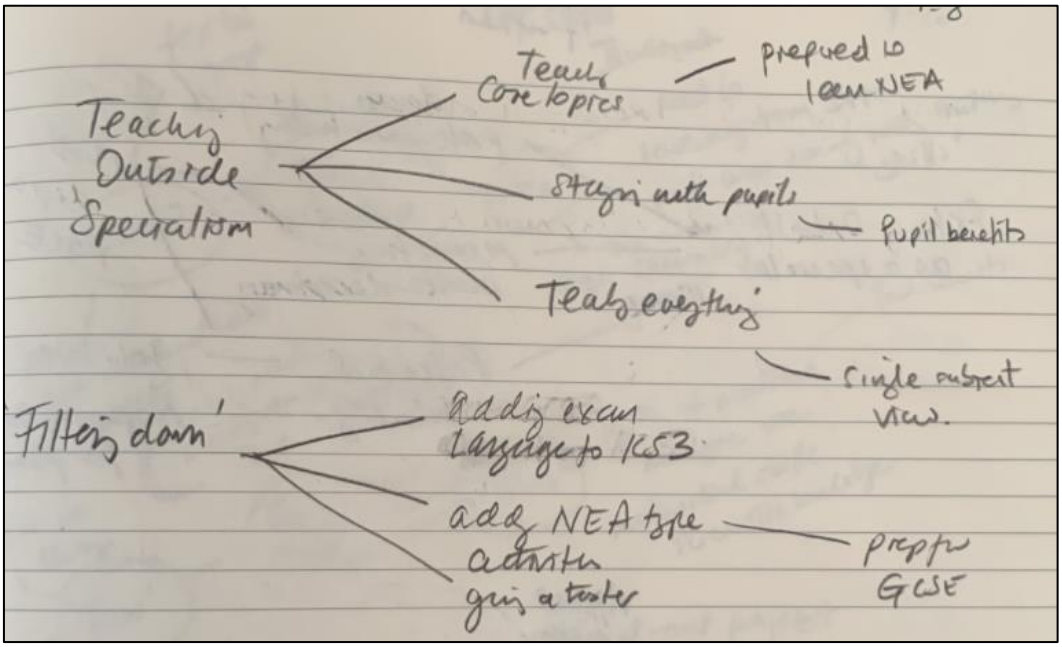


Figure 19: Domain and taxonomic code – hand written example.

3.4.4.iii Categorisation

Stage three involved the phenomenographic method of attributing a limited set of categories to the data, called ‘categories of description’ (Marton 1981, Bowden and Walsh 2000, Patrick 2000). Categories of description, within phenomenography, mean the different ways that teachers’ accounts of subject development and change can be categorised to describe conceptions of change. This stage can only happen after the first two stages because the coding hierarchy comes from the codes achieved in stage two. What makes the last stage different is the intention to question the similarities within the data and uncover the limited ways individuals understand the phenomenon.

The steps in stage three concerned two types of activity. The first step involved drawing on the thematic codes to identify a limited set of categories. The categories focused on three descriptions of subject traditions and coherence, across:

- teaching;
- working;
- understanding.

The second step involved interpreting the data by describing the different ways that teachers approached the curriculum development. Again, I used the coding to guide my interpretation and definition of the categories of approach for each theme.

All three stages represented different phenomenographical analyses and

combined to verify the data and add integrity to the methodology used. I was influenced by Ashworth and Lucas's (1998) argument that phenomenography needs to have integrity and that different analysis methods can add validity to the study. Through the generation of the Individual Teacher Profiles, Thematic codes and Categorisation, I checked how I empathised with my participants' contexts and described truthful accounts of their experiences.

3.4.5 Using CAQDAS to code the data

The hand-coding methods used in the Individual Teacher Profile stage of the analysis proved limited when I needed to sort the responses into types of practice focus and frame of reference (see Table 3, section 3.3). In addition, I needed an efficient way to retrieve the data once coded, because of the need to compare data statements to develop codes and categories. CAQDAS has been around since the 1980s (Gibbs 2018) and my Post Graduate Researcher (PGR) department held the licence for a software programme called NVivo. NVivo is a qualitative research software programme that allows researchers to import data from various sources spanning text to sound and image-based materials. Once the data has been collected as a 'project' within NVivo, the stages of coding and analysis can begin. The programme offers various digital coding options that allow data to be categorised and held in digital containers, called: (1) Nodes and (2) Cases. Nodes are a way to code the data in NVivo and Cases link a description to the data. For example, descriptions relating to gender, career stage and school type. I found NVivo helpful in

analysing my interview data which amounted to thousands of words. The coding process required hours of my time, and NVivo allowed me to organise the data and keep a record of my developing ideas about the data through built-in memos that enabled me to make notes on my data throughout the analytical process (Miles, Huberman and Saldaña 2020). NVivo also allowed me to set up queries of the data that are word-based, number-based and visual. During the first-cycle of coding, I used NVivo to code the data by allocating chunks of text to a code. A code that would then be allocated to other chunks of relevant text. For example, the code *teaching subject change* (leading to overarching theme – *Teaching a subject reform*) was initially used to group chunks of text about teaching in and outside a specialism (see description and sample of codes in Appendix item 2). I found this process in NVivo easier than using a hand method because I was able to code small areas of text and build up several codes that, on paper, would become unmanageable and difficult to extract when needed. During the second-cycle coding, I used NVivo to pull up all the similar codes and check their fit against the code description. Once I felt happy with the codes I started to move beyond description and think about what the codes – or chunks of text meant conceptually. To do this I developed coding hierarchies that enabled me to see how different codes fitted together. For example, the code 'teaching outside a specialism' (which I later re-coded to '*coming off the circus'*) was created from the codes 'teaching core topics', 'staying with pupils' and 'teaching everything'. The program allowed me to compare codes against other codes and against case features (like job role). Although, the

software was able to visualise data (including charts, word clouds, word trees and mind maps) I chose to organise and display data in alternative ways. For example, when developing domain and taxonomic codes to generate themes I used a mixed approach involving NVivo alongside spreadsheets and hand drawings, see Figure 19. This compromise of mixed approaches ensured I was able to assess the fit between individual responses and my code description and reflect on what the data was telling me conceptually.

3.4.6 Data Verification

To support data verification I worked closely with my supervisors to agree a coding framework and compare initial thematic coding processes. During the initial coding phase my supervisor and I both completed separate hand-coding activities on the first two interview transcriptions. We did this to compare the data identified and focus of statements. The activity identified alignments and generated a discussion about the codes assigned to some chunks of text. These discussions helped me to clarify what each code would and would not represent.

3.5 Ethical Considerations

Ethical considerations for the study have been informed by the British Ethical Research Association (BERA) guidelines (2018) and conform to the University of Nottingham research ethics approval processes. I will use this part to recount how I have engaged in my research institution's ethical processes and been vigilant to ethical issues as and when they

have presented during the study.

The formal process of ethical considerations included two stages. The first stage, involved the technical step of first meeting my research institution's ethical processes as an educational researcher and PGR. These processes consisted of an application that involved three documents:

- the consideration of research purposes (see Appendix item 3);
- research instruments (see Appendix item 4);
- a series of communications with my participants (see Appendix item 5 - 8).

The second stage involved the wait for confirmation of approval, or any further actions as a consequence of the review process. I completed the process and received ethical approval for my project on 19 September 2018. Feedback from the process highlighted two issues for review. The first change concerned updated General Data Protection Regulations (GDPR) between my initial application and approval (JISC 2017). I updated participant communication documents to include a privacy notice (see Appendix item 11). The second was related to an observation concerning the wording of the follow-up email (see Appendix item 8). I based the letter on an example from the ‘Phenomenological Research Methods’ book (Moustakas 1994), which included a phrase to the participant that instructed the participants ‘not to correct grammatical points when they review their interviews’. The phrase dictated certain behaviours to the participants that were unnecessary and not in keeping with ‘the community spirit’ of future educational researchers (BERA 2018,

p. 29). On reflection, I had no strong feeling about the inclusion of this phrase. I wanted to present a simple process for my participants, post-interview. My desire to make the process simple had resulted in cause for concern. In discussion with my supervisor, a compromise was reached for me to soften my language and explain the verbatim nature of transcription from a PGR point of view. I changed the second paragraph on the post-interview email to emphasise the focus of the interview, on their story and not the grammar. With a proviso that if they 'spot any factual errors' they were free to 'add the changes using the 'Review' setting in 'Word' (see Appendix item 10).

3.6 Confidentiality and Consent

One confidentiality issue arose during the data collection stage when I started to use an online dictation service. The service called Otter.ai (https://otter.ai) is an artificial intelligence (AI) system that transcribes audio into text. The service allows users to upload MP4 files or live voice recordings for translation into a text file that can be copied and pasted into a word document (and others). The service meant that the slow process of manual transcription could be replaced with an automatic system. However, the system was not 100% accurate, and the automatic transcription required close reading and revisions against the original audio.

Furthermore, the website gave limited information about its potential use in a research context and no information on '[p]rivacy and data storage' (BERA 2018, p. 25). Whittaker (2018) writing on a popular web forum,

highlighted concerns with privacy. Consequently, in discussion with my supervisor, I opted to reduce the time I stored the transcriptions within Otter.ai by ensuring files were deleted after 30 days.

3.7 Summary

In summary, this chapter set out to justify the research design decisions made to generate a detailed description and in-depth understanding of the different ways that secondary teachers are responding to a subject change. By designing a qualitative study to generate data across a range of different settings with individual teachers who were all experiencing the same phenomenon, I was able to generate rich data from a small sample of subjects with a specific variable (teachers that graduated from the same English ITE course). I have also argued for the use of interviews as the primary research method aligning to phenomenographic methodologies. Project reliability was discussed through the interrogation of interview procedures and ethical considerations. The final section, explained the analytical framework used to justify my analysis procedures, ensuring a level of replicability and validation.

Justifying research design decisions has helped me to ‘trace the process by which [my] findings have emerged’ (Ashworth and Lucas 2000, p. 300). The next chapter will present the findings of my project. First, I will show the individual profiles of each participant, followed by a set of themes that map my participants' perceptions of teaching design and technology with my criteria of relevance, and finally a set of hierarchical categories of description (Marton 1981, Bowden and Walsh 2000, Patrick 2000).

Chapter 4 Individual design and technology teacher profiles

This chapter provides a set of individual design and technology teacher profiles that capture the participants' experiences, based on the interview data. Each profile describes the specific issues and challenges that the design and technology teachers faced when translating policy development into practice. Each profile combines demographic information, a rich picture of the interview transcript followed by a textual description and findings summary. The chapter reveals the teachers' focus and frame of reference (Bowden 2000), which in turn, provides an understanding of the ways agency is achieved (Priestley, Biesta and Robinson 2015) and develops answers to both research questions:

- what are the specific issues and challenges that design and technology teachers face when translating policy development into practice?
- what experiences influence teachers' responses to the challenges this specific policy development brings to established practice, focusing on their agency?

Before describing the individual design and technology teacher profiles, an overview of the research sample is presented.

4.1 Overview

My final sample was made up of a diverse set of teachers that had both shared and contrasting experiences. The teachers all shared the characteristic of teaching secondary design and technology and

completed their teacher preparation with the same university (the researcher's own) to 'enable comparison' (Cohen, Manion and Morrison 2011, p. 157). However, the sample was made up of seven female and five male participants, see Figure 20. The teachers' past experiences of work settings, included teaching across one to three schools; within a three to eleven year career history. Five of the sample held a head of department role, and two participants worked part-time. The teachers' first-degree qualifications spanned a variety of disciplines (see Appendix item 15 for a comparable breakdown of the participants' data).

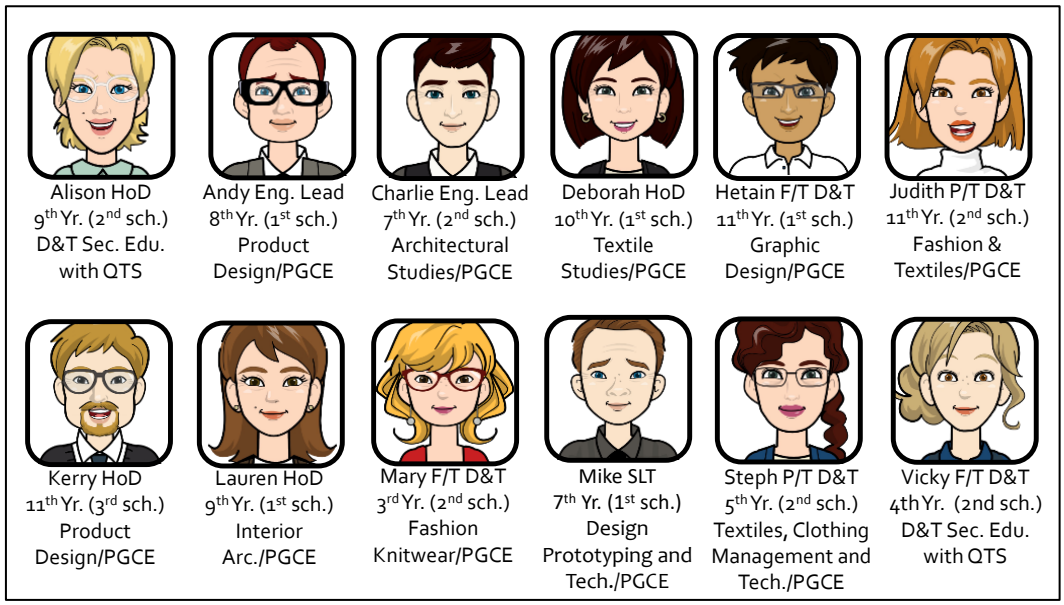


Figure 20: Participant demographical data.

For ethical reasons, the real names of participants have not been used. The findings do, however, make use of pseudonyms and avatars so that the narratives are easier to read and create a more personal account.

4.2 Alison

Alison HoD
9th Yr. (2nd sch.)

- **At the time of the interview:** Alison (female) worked in a sizeable MAT secondary school in the East Midlands. She had been teaching for nine years, and this was her second school since graduating with a BA (Hons) in Secondary design and technology education with QTS.
- Alison had just completed a one-year secondment to SLT, she was the subject lead for design and technology in a dept. of two teachers – she had sole responsibility for KS4.

Figure 21: Demographic and contextual information relating to Alison.

Alison's account of translating policy reform into practice focused on pupil learning and subject delivery. Issues and challenges included the length of time given to design and technology teaching, Ofsted, pedagogy, and what it was like working within a Multi-Academy Trust (MAT), see Figure 22. Alison talked about how the department recently went to a '3-year KS4', which gave her 'extra time' with her pupils at GCSE. She discussed how this gave her extra time to develop pupils' skills to pass examinations and practice non-exam assessment (NEA) projects. Ofsted recommendations about two year GCSE courses were perceived to be a threat to this practice in future timetables. Alison feared that eight-week rotations with her year nine pupils would not be enough time to develop design and technology knowledge. She felt this would have a 'detrimental effect' on her pupils' progress.

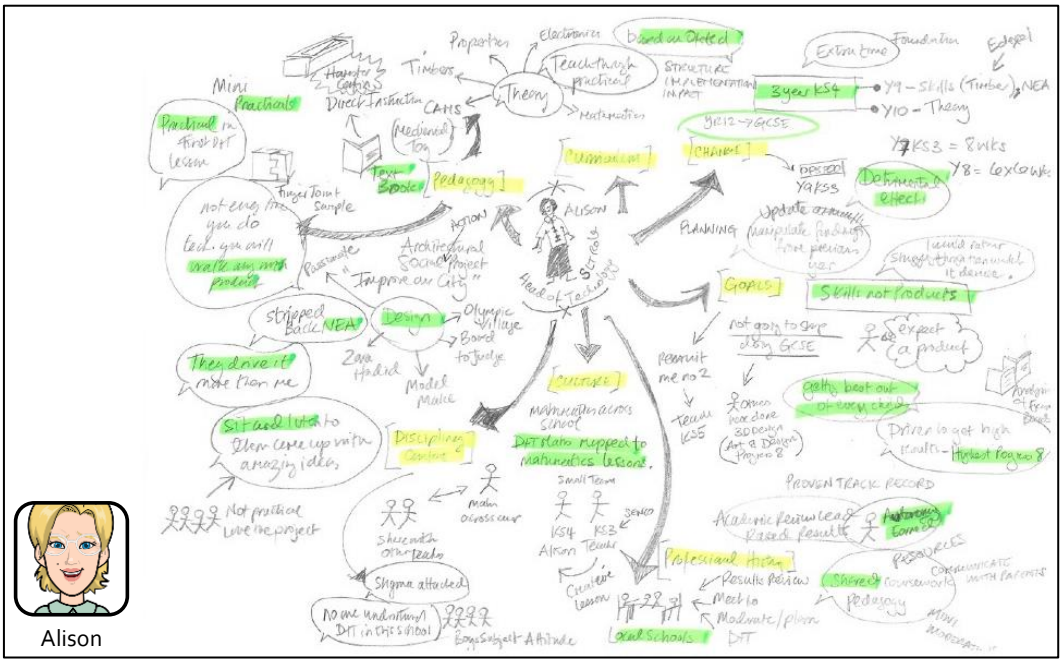


Figure 22: Visualisation of Alison's interview data (a larger copy of each visualisation can be viewed in the Appendix (see Appendix item 16).

Alison talked about how she often updated her schemes of work as a way of building on her 'findings from previous years' and other influencing factors like Ofsted. She did not say this was a problem, but she talked about how she would update her KS4 content in line with Ofsted's focus on structure, implementation and impact. She debated the fact that she felt confident about the 'autonomy earned' by herself as a consequence of raising pupil results in design and technology, which gave her a 'proven track record' (of results).

Alison acknowledged that the new GCSE was based on A-level teaching – a fact gleaned from an exam board representative (verified by Lauren) and included more theory. However, the problem for her was not the content but the way she initially taught the content through direct instruction and 'textbooks'. She then discussed how she had taught the content initially in this way and then realised that she could teach the

theory through mini-practical activities. She gave the mechanical toy project as an example of teaching the technical knowledge associated with computer aided manufacturing (CAM). The problem for Alison was that she needed to educate parents and pupils that ‘not every time you do technology will you walk away with a product’. She discussed how pupils expected ‘a product’, and how she needed to re-educate parents and pupils about this.

Alison talked about teaching a ‘stripped back NEA’ in year 8. In this project, she set the pupils a ‘social action project’ to improve their XX City through architecture. The project involved content about the architect Zara Hadid and the Olympic Park site and how geographical areas could be transformed through design – architecture. The pupils researched aspects of their town. They came up with ‘amazing ideas’ that they realised as models and presented in a ‘Dragons Den’ type activity where Alison bought in local business people and senior teachers to judge the pupils’ results. Alison’s problem with this project was that her teaching was reduced because once she instructed the pupils to get started on the design and make activity she had little teaching to do. She felt that she was not teaching the pupils because all she had to do was ‘sit and listen to them come up with amazing ideas’; as ‘they [the pupils] drive it [the project] not me’. She talked about how the pupils ‘love the project’ even though it is ‘not [conventionally] practical’.

Alison talked about how the school had embraced maths across the curriculum by identifying a teacher with responsibility for maths across the

curriculum. Alison had then worked with this teacher to map design and technology maths to the maths lessons. She talked about the problem of introducing mathematical concepts at the right time, giving the example that some pupils would not have been introduced to concepts like trigonometry in maths lessons before applying them in design and technology, leading to issues with a pupil's progress and capacity to achieve. Alison talked about this being completed in her spare time and her friendly relationship with the head of mathematics, making it easier for them to meet up and work together.

Alison HoD
9th Yr. (2nd sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
Teaching A-level at GCSE	Shift to more theory
3 year KS4	Extra time with pupils/pass exams
'stripped back NEA projects'	'they drive it not me'/pass exams
Teaching theory through mini-practicals	Skills not projects /educate parents
Using commercial textbooks	To teach theory content
Annual update of curriculum	'track record' of high results/Ofsted
Mathematics	School initiative/congruence
Collaboration	Knowledge exchange with friends/academy expectation

Figure 23: A summary of the issues and challenges that Alison faced.

Alison talked about how as a member of an Academy Trust, there was an expectation for heads of design and technology across the academy to meet up three times a year to review results, moderate work and share good practice. She felt that she shared and others did not. Alison felt that the other teachers did not share her desire for 'getting the best out of every child'. They often ignored her offer to share advice about using 'mini

moderations' in coursework. She talked about how some of the group had started to ring her up for advice, but they still had not shared anything in return.

An individual analysis of Alison's profile highlights a set of issues and challenges that describe what she was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on pedagogy, time with pupils, resources, sharing expertise, teacher reflection, subject content and teaching through contexts, see Figure 23.

4.3 Andy

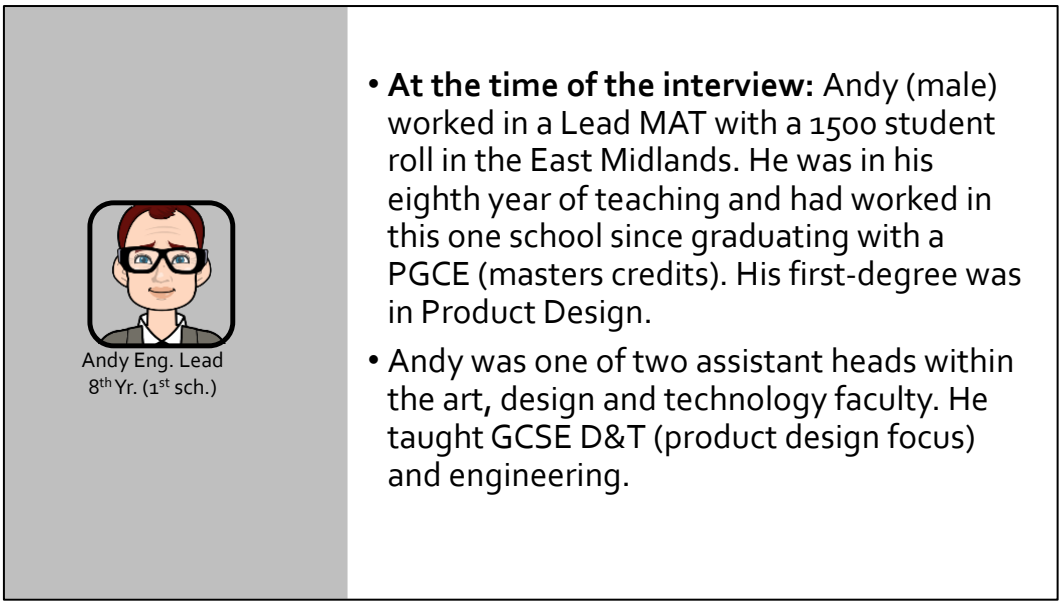


Figure 24: Demographic and contextual information relating to Andy.

Andy's account of translating policy reform into practice jumped from topic to topic, emphasising a lack of coherence about the main problems experienced, see Figure 25. As the interview progressed, issues and challenges were identified concerning relationships, professional

knowledge, teacher confidence, time for planning, curriculum delivery, and the additional content of maths and science. Andy talked about how the department faculty had a new name encompassing art and design and design and technology within one discipline of 'creative arts'. However, he still referred to design and technology as 'tech'. He explained how a shortage of specialist 'tech' teachers had meant that art and design teachers were being used to deliver the subject. Andy debated how the lack of design and technology teachers had led to a loss of subject time within the faculty. This reduction in timetable hours had resulted in graphic product lessons (once the preserve of design and technology teachers) being replaced with an Art GCSE that meant KS3 graphics were no longer taught in design and technology. He noted that this action had caused divisions within the team of 'tech teachers' when they had 'pushed back' at the perceived loss of time and subject purpose. He discussed how this related to changes to the school's dropping of technology status and design and technology no longer being part of the core curriculum within the school. He also discussed original misgivings about ideas from art that filtered through to design and technology. For example, the introduction of sketchbooks which he could see supported progress and kept pupils' work for longer, but also led to books looking a 'mess'.

Andy talked about how the new contextual challenge – NEA coursework – aspect of the examination was released in a more controlled way which meant the school (or he) 'couldn't get ahead of the game' by starting project work early. He was also concerned that he chose an exam board that gave explicit content about what needed to be studied. So that he

would ‘know where I stand’ in regard to lesson content and teaching.

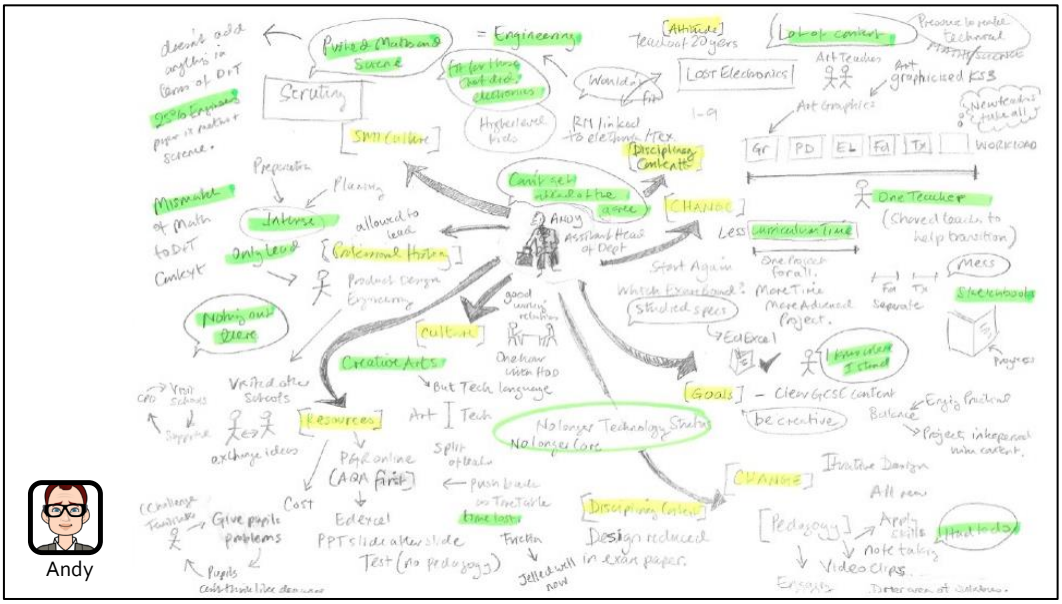


Figure 25: Visualisation of Andy’s interview data.

Andy talked about how the changes had led to an ‘intense’ period for him, especially as he was the only lead with engineering and product design specialisms. When he first started to plan and teach the examination, there had been ‘nothing out there’, and so he had gone out and spoken to other design and technology teachers as a way to find out what others were doing. This had led him to some online resources that other teachers were using. Andy was concerned that these resources were not originally specific to his exam board, and when they were, they only included PowerPoint presentations, which he described as ‘slide after slide’ of technical knowledge and some tests. But no information about how to teach the subject content. He felt that he ‘had to do’ dry teaching focused on note-taking because the content of the new exam had ‘lots of content’ for which he did not have time to develop engaging activities. However, he did discuss how he had tried to engage the pupils through video clips and

to get the pupils to apply the skills learnt within each lesson to the next (or future) lessons.

Andy was concerned that there was a lack of ‘fit for those [pupils] that did electronics’ previously, because the new GCSE required them to learn about all material areas. He thought this was not a problem for pupils that had previously studied RM because they were used to linking the subject to electronics and textiles. Andy described how he had dealt with this issue by introducing the engineering GCSE. This was because the majority of pupils that had opted to do the engineering GCSE had high predicted grades, Andy found that the senior management team were consequently ‘scrutinising’ his work.

Andy Eng. Lead
8th Yr. (1st sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
Loss of subject time/Using sketchbooks	Creative arts faculty/Support pupil progress
Choosing exam boards	Explicit disciplinary content
Seeking advice outside school	‘nothing out there’
Teaching lots of content	Less design questions at expense of mathematics and science
Using commercial textbooks/online materials	To teach increased content/loss of time on curriculum
Active teaching	Result of boring commercial online resources
Introducing engineering	‘fit for’ electronics pupils

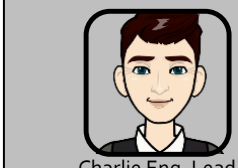
Figure 26: A summary of the issues and challenges that Andy faced.

Andy had some interesting concerns about the amount of maths and science in the new GCSE. He talked about the amount of maths and science, and that questions appeared to be more concerned with testing Pythagoras’ theorem rather than engineering capability. He also talked

about how the question in the design and technology paper about waste was not relevant to wood as opposed to aluminium which could be melted down and reused. He was concerned that whoever wrote the exam was under pressure to add maths and science to make the examination more technical, which led to an observation that the examination questions about design had been reduced in the paper, compared to the previous year.

An individual analysis of Andy's profile highlights a set of issues and challenges that describe what he was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on teaching content, pedagogy, resources, school systems, expertise and generating new traditions – like the introduction of GCSE engineering, see Figure 26.

4.4 Charlie



Charlie Eng. Lead
7th Yr. (2nd sch.)

- **At the time of the interview:** Charlie worked in a large MAT faith secondary school in the East Midlands. He was in his seventh year of teaching design and technology, and this was the second school he had worked in since graduating with a PGCE (masters credits). His first-degree was in Architectural Studies.
- Charlie was responsible for the subject leadership of engineering and taught across material specialisms at KS3.

Figure 27: Demographic and contextual information relating to Charlie.

Charlie's account of translating policy reform into practice focused on issues and challenges with the teaching environments, his beliefs about teaching design and technology, and goals for the subject and himself, see Figure 28. He mentioned how the department was traditional, with rooms that appeared old fashioned. He illustrated this when he spoke about a parent's comment that the teaching room had not changed since they were a pupil at the school. He later mentioned a lecture from a visiting speaker while he was a student-teacher. He remembered a quote about technology constantly changing and teachers needing to be up-to-date on new materials and technology. He was concerned that design and technology in the school should move towards a more modern curriculum that taught coding and electronics through flexible tasks. He mentioned that his previous school had emphasised a modern version of the curriculum.

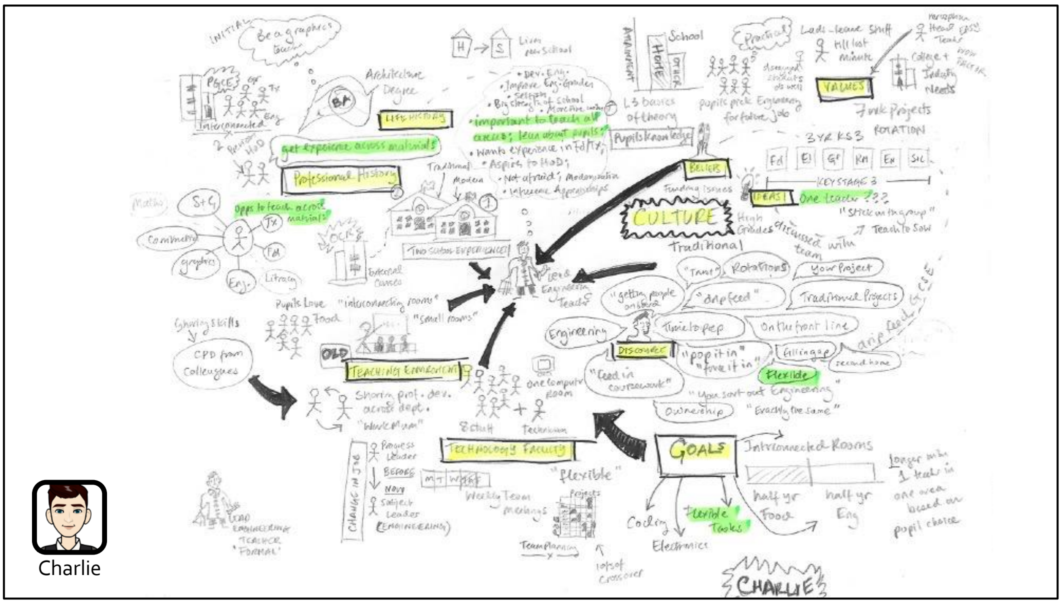
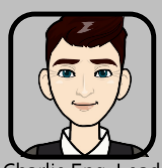


Figure 28: Visualisation of Charlie's interview data.

Charlie was very concerned with being flexible. He liked having

opportunities to teach across material areas. However, Charlie demonstrated concern that this was not possible unless he had mastered 'getting people on board' because he could not do this alone. He discussed that he had a stronger voice in the department when he was responsible for progress across the department, but a school re-allocation of teaching tasks had reduced his responsibility to that of engineering lead teacher.

Funding was also a concern for Charlie, alongside the apparent lack of understanding from the Senior Leadership Team (SLT). He perceived the comments that the SLT made about the way that anyone could teach the subject, to be disparaging and in contradiction to the way they used the department as a focal point for visiting pupils and parents.



Charlie Eng. Lead
7th Yr. (2nd sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
Traditional curriculum (environment)	Coding, electronics and flexible tasks/compared to old school
Specialist team - sub-cultural retreat	Not all staff want to teach across/ not on board with dev.
Teaching across material areas	Be flexible and embrace opportunities/get people on board
Improving teaching rooms	Create a modern environment/perceived lack of value for subject by SLT
Losing voice	School reshuffle

Figure 29: A summary of the issues and challenges that Charlie faced.

An individual analysis of Charlie's profile highlights a set of issues and challenges that describe what he was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present

(Emirbayer and Mische 1998) focused on, teaching across material areas, teaching environments, school systems and persisting traditions, see Figure 29.

4.5 Deborah

Deborah HoD
10th Yr. (1st sch.)

- **At the time of the interview:** Deborah (female) worked in a secondary MAT in the East Midlands. The school had recently moved into a new building. She was in her 10th year of teaching, and she had worked in the same school since graduating with a PGCE (masters credits). Her first-degree was in BSc Textile Studies (engineering option) and she had previously worked in the fashion industry.
- Deborah was Head of Department (HoD) and taught across GCSE D&T and Food Preparation and Nutrition.

Figure 30: Demographic and contextual information relating to Deborah.

Deborah's account of translating policy reform into practice were framed by a recent move into a new school building. As the interview progressed, issues and challenges were identified concerning the timing of support for the new curriculum implementation, new subject teaching staff, curriculum content, pedagogy, and assessment processes, see Figure 31. Early in the interview, Deborah raised the fact that organisations like the British Nutrition Foundation had been quick to support teaching the new food GCSE (Department for Education 2015c) with guidelines on what to cover and how to teach the new curriculum at KS3. However, she was concerned that guidance for the new design and technology GCSE had not been so readily forthcoming, and teachers had needed to work things

out for themselves. She later discussed how she would like advice on teaching textiles within design and technology and how to get this aspect into the rotations, although she also discussed how some of the team had not been willing to adopt teaching in all areas of the new GCSE.

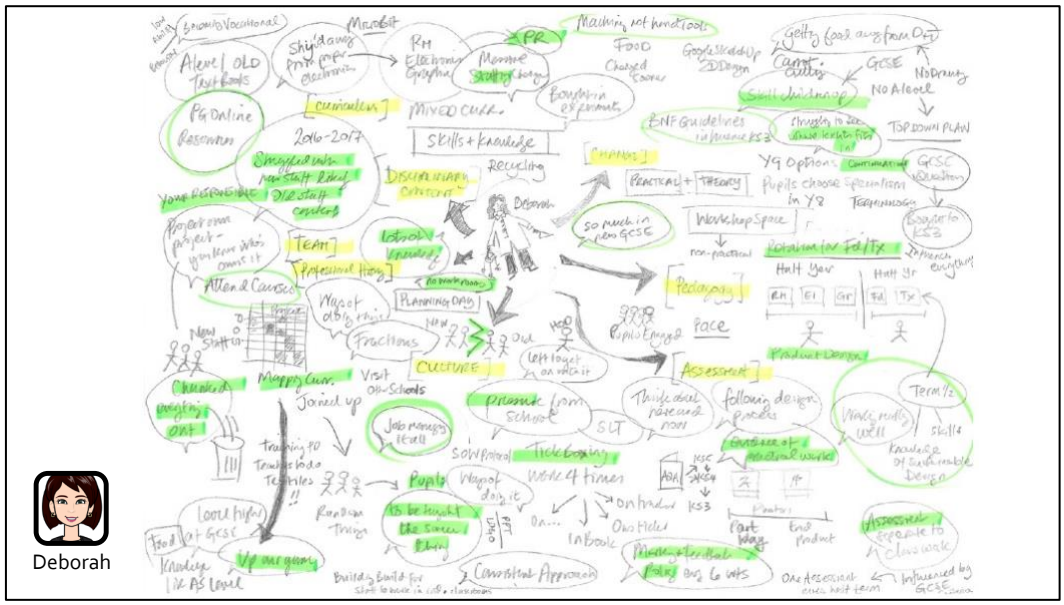


Figure 31: Visualisation of Deborah's interview data.

Deborah later discussed the matter of 'massive staffing changes' during the same period as the new GCSE introduction. The changes had meant that the new staff had 'struggled' with delivering the school's existing schemes of work, and they had 'chucked everything out' causing 'factions' within the team. This was a problem in the first year because the new staff had created a great deal of work for themselves and this led to a lack of consistency which meant that not all pupils were 'taught the same thing', leading to problems the following year. Deborah talked about how the old school building had a public workroom, which meant that the team could work together, but the new school building did not have this. She debated the idea that these new teachers never had the opportunity to appreciate

joint working, and now they were isolated in individual classrooms, which made it a ‘job managing it all’ for her.

Deborah also talked about how the new curriculum for design and technology included ‘lots of knowledge’. She described how this meant the team needed to ‘up our game’ through a ‘top-down plan’, using the KS4 specifications to plan KS3. This was not seen as a problem as Deborah discussed the fact that now the GCSE was a level higher, she needed to teach ‘knowledge like A-level’. The school had purchased an online resource and used GCSE textbooks to support the new teaching. This focus on a need to ‘up our game’ and ensure pupils were ‘taught the same thing’ linked to later conversations with Deborah about how she felt ‘pressure from school’, when senior leadership insisted on administrative tasks felt like ‘tick-boxing’. The need for consistency and higher levels of teaching linked to the ‘marking and feedback policy’ that required staff to complete assessments every six weeks. The regular assessment was a problem because the staff felt that they had to repeat administrative tasks when asked to ‘do the same thing four times’.

An individual analysis of Deborah’s profile highlights a set of issues and challenges that describe what she was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on curriculum planning, relationships, resources, school systems, expertise and teaching content, see Figure 32.

Deborah HoD
10th Yr. (1st sch.)

Practical Focus Practical- evaluative dimension of agency	Frame of reference Iterative/Projective dimension of agency
Lack of support for D&T	Compared to support for food
Teaching A-level at GCSE	Shift to more theory
'top-down plan'	New curriculum has 'lots of knowledge'
Using commercial online materials	New learning/to 'up our game'
Repetitive administrative tasks	Pressure from school for regular assessments
Working in isolation from colleagues	Lack of dialogue/lack of joint working/new staff changes

Figure 32: A summary of the issues and challenges that Deborah faced.

4.6 Hetain

Hetain F/T D&T
11th Yr. (1st sch.)

- **At the time of the interview:** Hetain (male) worked in an 11 to 16 co-educational comprehensive secondary school in a large city in the East Midlands. The school was housed in a modern BSF rebuild. Hetain was in his eleventh year of teaching at the same school since graduating with a PGCE. His first-degree was in Graphic Design.
- Hetain worked full-time and taught GCSE D&T (textile & plastic focus) alongside KS3 textiles.

Figure 33: Demographic and contextual information relating to Hetain.

Hetain's account of translating policy reform into practice focused on issues and challenges with the speed at which curriculum changes had happened. He told of the resulting need for teachers to learn new content that they were unfamiliar with, ways to 'sell' the new single subject to pupils, and a perceived loss of creativity, see Figure 34. Hetain initially

spoke about the change to KS4 and how this needed to inform KS3. He talked about how they needed to ‘filter it [the curriculum] down’ to have a ‘theory focus’, including ‘maths skills within design and technology’ and ‘scientific skills’. The inclusion of mathematical and scientific knowledge was described as a problem when Hetain expressed his feelings about ‘creativity compromised’. He felt that because the new GCSE included a lot of knowledge he conceded to teach less ‘fashion’ and ‘creativity’.

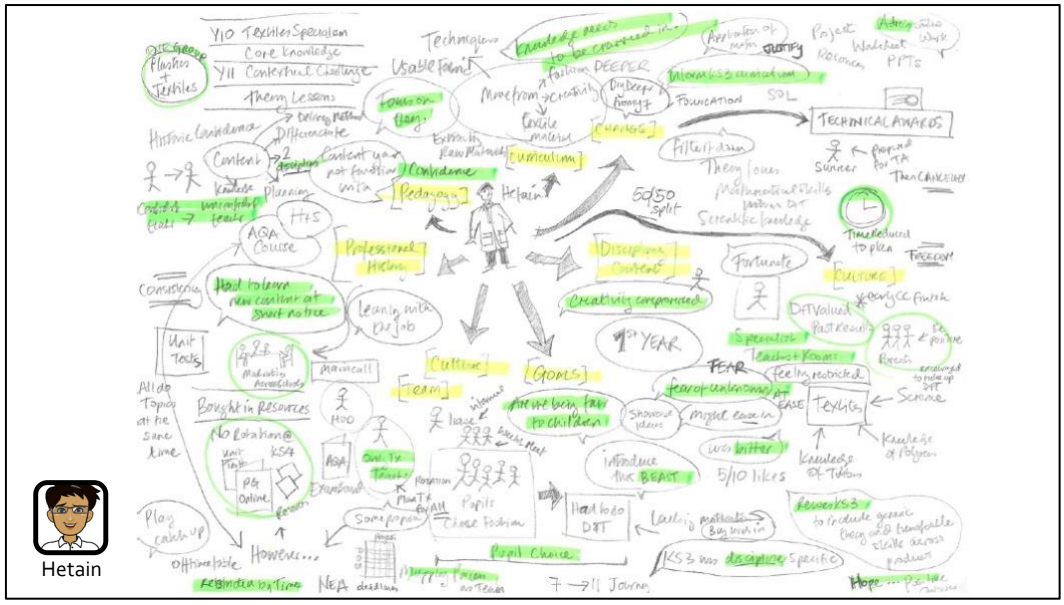


Figure 34: Visualisation of Hetain’s interview data.

Hetain spoke about how the need to teach ‘content you are not familiar with’ led to issues with his confidence as a teacher. He was a valued teacher with a history of high examination results, so he felt a reduction in confidence keenly. This was a problem because he now felt unconfident, and pupil numbers for textiles had dropped. He talked about his new group being made up of a few textile pupils and more product design pupils who were interested in specialising in plastics. This meant that he needed to differentiate his planning whilst ‘learning the new content’ and

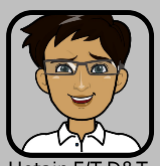
considering alternative ‘delivery methods’.

Hetain explained how the team had spent the summer planning for the new Technical Award (AQA 2016), only to find it cancelled in September (2017). Instead, the school opted to introduce the new GCSE for design and technology, which meant that Hetain ‘had to learn new content at short notice’. A change that meant he was, ‘learning on the job’, which he felt was unfair on his pupils. The team initially sought to operate a rotation system in Year 10 so that each specialist teacher taught their specialist core knowledge to each GCSE group. However, Hetain then explained that once the team completed GCSE training with the examination board, this idea was ‘dropped’ and instead, they ‘brought in resource’ from ‘PG Online’ (commercial teaching publications), including ‘revision guides’ for each teacher to deliver to their own class. The team needed to be consistent, and the head of department insisted that each teacher deliver the topics during the same weeks. Hetain discussed how this decision made him feel ‘restricted’, but he also talked about how this linked to a ‘fear of unknown’ and that things ‘might ease in’ once he had his results back and taught the scheme for the second time.

Hetain talked about how the pupils had initially chosen to do the Fashion Technical Award and been disappointed when they arrived in September to find out that they were on the GCSE design and technology route. He talked about how this led to pupils ‘lacking motivation’ and had asked himself: ‘are we being fair to the children? He talked about how he and his colleagues needed to ‘be positive’ and ‘buy kids in’ to the new GCSE. The

use of departmental curriculum reviews informed the team's updates to KS3 - 'to include generic theory and transferable skills across [materials]' - which he 'hoped' would lead to a more 'positive outcome' regarding the 'pupils' expectations of the subject' in the future.

Hetain spoke about how he had been quite 'bitter' about the new GCSE. He felt that 'creativity [was] compromised' due to the addition of science and other core content areas. This was a problem because fewer pupils who wanted to specialise in textiles were taking the GCSE. He debated the need for pupils to apply maths knowledge and justify design and technology's position as a valid subject.



Hetain F/T D&T
11th Yr. (1st sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
'cram in knowledge'	'creativity compromised'
Mapping KS3 against GCSE	Need to 'filter ... down' GCSE content including mathematical and scientific knowledge
Numbers dropping in textiles	Unfamiliar content/lack of teacher confidence
Teaching consistent to other teachers	Consistent delivery of topics/high results track record
Changing course at last minute	Prioritising progress 8 subjects/being lead by SLT
Using commercial online materials	New learning

Figure 35: A summary of the issues and challenges that Hetain faced.

An individual analysis of Hetain's profile highlights a set of issues and challenges that describe what he was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on consistency, curriculum planning, pupil take-up, resources, school systems and teaching content,

see Figure 35.

4.7 Judith

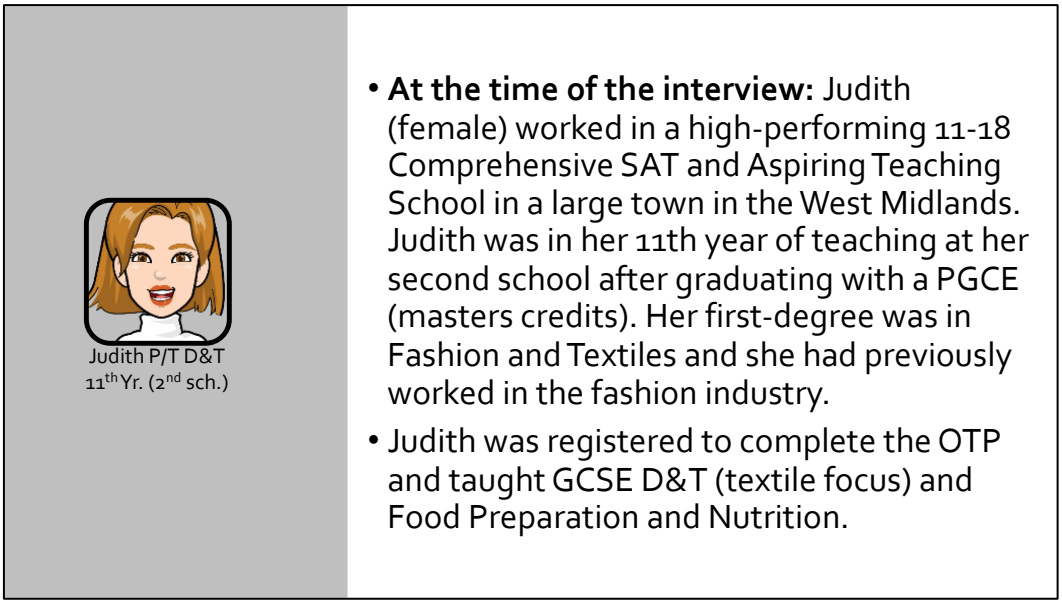


Figure 36: Demographic and contextual information relating to Judith.

Judith's account of translating policy reform into practice was framed by the context of working within a small teaching team that she described as 'active teachers'. Issues and challenges included a supportive head of department, 'unique' relationships, curriculum delivery, team aspirations, GCSE pressures, and the new curriculum content, see Figure 37. Judith spoke about how she had brought her experience of 'coming off the circus' to this school. In her interview, she talked about how the school was 'up for her doing it [breaking with carousel teaching] here'. Judith then described how all teachers in the department had 'mini-training' to 'keep the pupils for the year' and deliver six-week modules on polymers, pewter casting, textiles, food, timbers and an engineering block (12 weeks). She talked about how the design 'help[ed] track progress', and there was also a desire to keep the same teacher with KS3 for both years (the school

operated a two year KS3). Finally, she discussed the positive outcome of having all her Year 8 classes opting for GCSE design and technology.

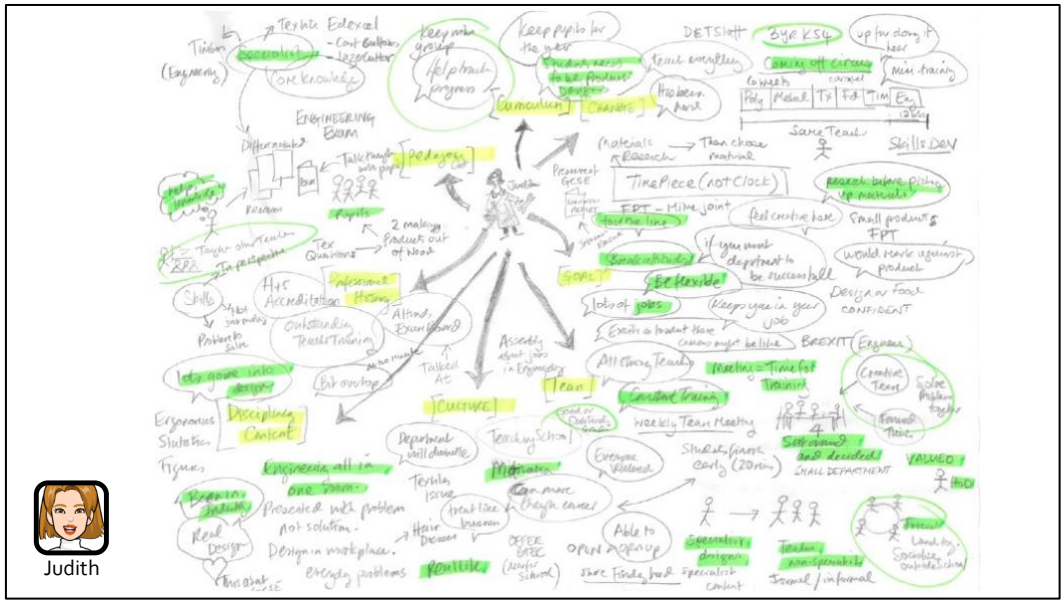


Figure 37: Visualisation of Judith's interview data.

Judith spoke about how the teachers all 'teach everything' even though it has 'been hard'. She described how the team use their weekly team meeting to train each other in aspects of the curriculum that are new and are 'constantly training'. Judith talked about how the 'specialist teacher' designs the curriculum content for their specialism and then shares the resources with colleagues and delivers training events, both formal and informal. She discussed how she was happy to share insecurities and areas of knowledge that are missing with her department. She illustrated the way a colleague had shared their resources and helped her out with an aspect of examination knowledge that she wanted to 'talk through with her pupils'. She attributed this to the head of department, who made 'everyone [feel] valued'. She also explained how the school finished lessons early on the team meeting afternoon, so staff only contributed half

of the session from their own time.

Judith described her liking of the new curriculum content. She described a desire for ‘breaking [traditional] attitudes’ towards design and technology in her learners. She didn’t want to just teach a single aspect of design and technology, for example, food technology, but all aspects of the subject because she wanted her pupils to see the subject as one, because she felt that ‘students need to be product designers’. This links to her discussion about the way the department was teaching a module called engineering at KS3 and planning to deliver GCSE engineering in the next academic year. When I asked Judith about engineering, she described this as teaching about all materials in one room. She also spoke about the way the pupils were ‘presented with [a] problem not [a] solution’, and that the problems presented were ‘every day’ and ‘real’. This was important to Judith because she felt that her experience of having ‘been in the industry’, gave her insight into the substantive knowledge that goes into ‘design’, including ‘ergonomics’, ‘statistics’, and ‘figures’. She felt the new GCSE did this and that she explained was what she ‘loved [...] about the GCSE’.

Judith talked about how she had more freedom to decide on content at KS3 than KS4. She felt the ‘pressure of GCSE’ to conform to examination reports and ‘toe the line’ about what the pupils produced in their coursework.

Judith P/T D&T
11th Yr. (2nd sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
'coming off the circus'	'breaking (traditional subject) attitudes'
Keeping 'pupils for the year'	Improved systems to track pupil progress/increased GCSE uptake
Teaching real life contexts	Industry experience, Fashion and Textiles Degree/Authentic D&M projects (a problem not a solution)
'mini-training' sessions – shared knowledge	Staff need training /Sharing resources and expertise – being flexible
'teach everything'	Pupils need to access to all the subject offers in multi-material classrooms

Figure 38: A summary of the issues and challenges that Judith faced.

An individual analysis of Judith's profile highlights a set of issues and challenges that describe what she was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on 'coming off circus', sharing expertise, and teaching through contexts, see Figure 38.

4.8 Kerry

Kerry talked about how the curriculum shifted from focusing on projects to a 'focus on skills'. In the discussion, he broadened his definition of skills to include knowledge of 'materials and manufacturing' and technical terminology, see Figure 40. Kerry saw the problem with the previous curriculum lacking 'real learning', and although projects had practical elements, there were 'wasted lessons'. He discussed that this had led to 're-planning' and increased 'workloads' but he felt this was 'worth the extra work' because it was beneficial to the pupils.

Kerry HoD
11th Yr. (3rd sch.)

- **At the time of the interview:** Kerry (male) worked in a large MAT in a suburb of a large city in the East Midlands. He was in his eleventh year of teaching, and this school was the third that Kerry had worked in since graduating with a PGCE (masters credits). His first-degree was in Product Design.
- Kerry was HoD in addition to teaching D&T across KS3 and GCSE D&T.

Figure 39: Demographic and contextual information relating to Kerry.

Kerry talked about how some of the pupils had been taught at KS3 by non-specialists – he had five teachers in design and technology this year. Having five non-specialist teachers was a problem for Kerry because four of the five non-specialist teachers had not wanted to teach the practical aspect of the subject. So curriculum was 'adapted to non-specialist teachers' needs, which meant some pupils missed out on the full design and technology curriculum. Kerry spoke about how this would be remedied the following year through a timetable block that had one teacher teaching the group for the whole year. The three units in food, textiles and product design (wood, metal and plastic – previously called RM) would be planned and resourced by the specialist teachers. Kerry talked about how he did not want to restrict children, and by teaching them the three different material areas, they would then be free to 'use any material [they] want'. He talked about how he was achieving this at KS5 but was yet to achieve this at KS3. He was concerned that the department had lost expertise in textiles from the KS3 curriculum, and he

wanted to get this back by employing a specialist textile teacher for the following September.

Figure 40: Visualisation of Kerry's interview data.

Kerry talked about his desire to 'encourage collaboration' and how he set out to coach his team in 'not [being] afraid to suggest new ideas'. He discussed the way he had given staff opportunities to develop curriculum and 'take risks' because he wanted to 'get people on board' with his idea that they plan together. Kerry talked about the informal morning meetings in departments where the team could talk about work and pupils with one another. He mentioned 'dialogue' several times. His focus on non-specialist teachers led to a conversation about how the carousel system had led to timetabling issues – due to its 'complexity' – that led to five non-specialist teachers teaching the curriculum at KS3. Kerry debated the pros and cons of using non-specialist teachers. He explained that he was concerned with the way non-specialist teachers taught across a variety of subjects, which meant they were being 'pulled from pillar-to-post', which

potentially led to a lack of time for effective lesson preparation. Kerry felt that design and technology was not the type of lesson you could just 'turn up' and teach.

Kerry HoD
11th Yr. (3rd sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
Using non-specialist teachers	Limited version of the curriculum
Re-planning the curriculum	'real learning', get textiles back into curriculum
Informal team meetings	Coaching team to 'take risks'
Shift to 'focus on skills'	Previous curriculum lacked 'real learning'
Networking with local schools	Values collaboration
Plan for one teacher teaching 3 units over whole year	Giving pupils choices 'use any material they want'

Figure 41: A summary of the issues and challenges that Kerry faced.

Kerry spoke about collaboration beyond his school department through network meetings across the Academy Trust. He discussed the way the network group of subject leads would plan a twice termly meeting to moderate, share best practices, and discuss teaching and learning.

An individual analysis of Kerry's profile highlights a set of issues and challenges that describe what he was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on curriculum planning, non-specialist teachers, relationships, sharing expertise, skills, and the new tradition of teaching three material specialism units over a year, see Figure 41.

4.9 Lauren

Lauren HoD
9th Yr. (1st sch.)

- **At the time of the interview:** Lauren (female) worked in a large MAT in the East Midlands. She was in her ninth year of teaching in the same school since she graduated with a PGCE (masters credits). Her first-degree was in Interior Architecture.
- Lauren was about to start an NPQSL and a conflict management course. She was a HoD (with responsibility for A&D) and taught across KS3 and GCSE D&T.

Figure 42: Demographic and contextual information relating to Lauren.

Lauren was enthusiastic about her job and how her line manager supported her efforts and made her feel that he 'believed in me', see Figure 43. She described her school as 'supportive of arts-based subjects'. Alongside design and technology, Lauren also had responsibility for Information and Communications Technology (ICT) and art and design. The varied range of subjects within her remit as head of department meant that she often found herself planning and teaching ICT content in addition to her work across design and technology.

Lauren talks about her 'battle to change old school style staff'. This is a problem because she wanted the curriculum to be relevant and engaging for the pupils. She talked about how the graphics teacher and herself (a product design teacher) had changed the content at KS3, and as a result, more pupils were opting for the subject at GCSE. She discussed how this was a positive growth and pondered how in light of this, they 'don't have

an RM group'. She debated the fact that this might be due to the lack of change in the KS3 curriculum for RM and the view that they 'just make cabinets'. Lauren wanted to get her team of seven to all 'sing from the same hymn-sheet', and she discussed how this was like 'pulling teeth', but she felt this was a consequence of a culture that had previously 'allowed them to do what they like'. Lauren also talks about the 'different skills' and 'potential' that she sees in her 'old school' teachers. She was concerned that they were trapped in a singular culture related to when they started teaching. She discusses how she has encouraged them to 'go out' and see other schools to gain 'recognition' for what they do well because she recognised their strengths alongside their weaknesses.

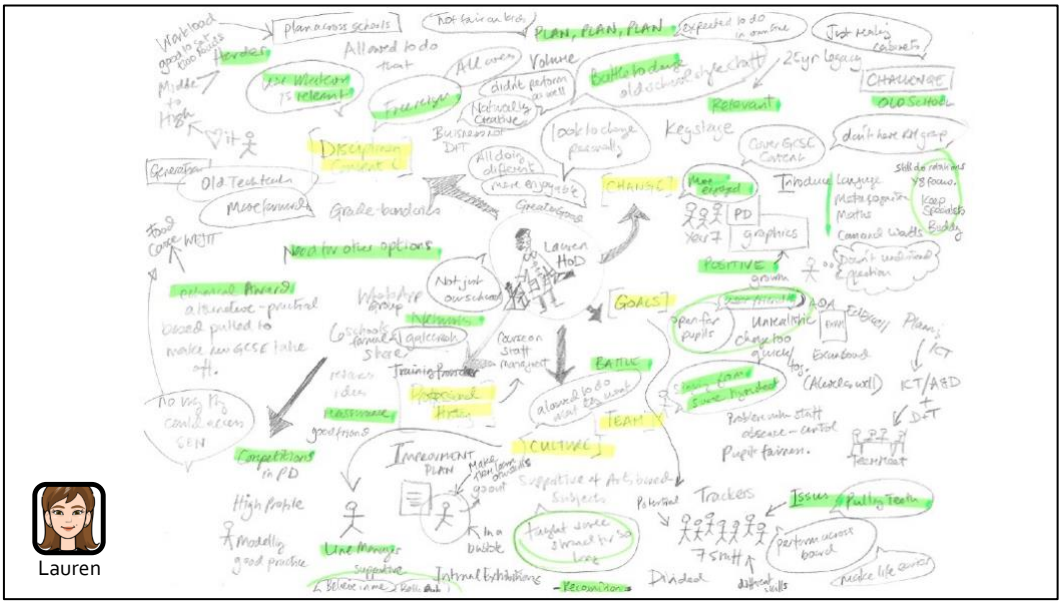


Figure 43: Visualisation of Lauren's interview data.

Lauren talked about how she planned to make the curriculum relevant by introducing content focused on language, metacognition and maths. She discussed how the pupils struggled with 'command words', which meant they 'didn't understand questions' on the exam paper. She talked about

how the new curriculum allowed pupils to ‘do all that [different material areas]’ and gave her pupils ‘free rein’ over their projects. She saw the problem with pupils ‘all doing different’ work as an issue for her as a teacher, but not for the pupils who found it ‘more enjoyable’ to access ‘all areas’ and make decisions about ‘using whatever is relevant’ to their project.

Lauren talked about how she wanted the exam board content to be ‘user-friendly’ and ‘open for pupils’. She recognized that other exam boards were not as open and could change content during the teaching. This was a problem, especially because Lauren had felt that the change to A-level at the same time as GCSE was ‘unrealistic’ for teachers. She discussed how she had rejected other exam boards due to specific content and focus.

Lauren talked about how the new curriculum was not suitable for pupils with low attainment. She debated how the government had pulled the Technical Awards because they might have thought teachers would ‘jump ship’ and not deliver the new GCSE. She disputed the idea that pupils with special educational needs (SEND) could complete the new GCSE in design and technology or Food Preparation and Nutrition. This led her to have a concern that ‘other options’ were provided. Later on, Lauren talked about how her pupils with ‘lower attainment’ had done better, in some cases, with the contextual challenge than her pupils with high attainment scores. She assumed that this was because they were ‘naturally creative’.

Lauren talked about how she was part of a network of teachers that met

regularly to share resources and ideas. She discussed the value of having ‘reassurance’ from more experienced colleagues in other schools that had similar issues to her. She had used the network to get ideas about raising the profile of her department by entering competitions, which she felt had worked in getting pupils interested in the graphics strand of design and technology. Her line manager supported her in this work, even though the school did not have its own network. She talked about how she had formed her own network during her training year and valued the way she could jointly plan her schemes of work with others in the group. She talked about how this reduced her workload and gave her another view about what she was doing.

Lauren HoD
9th Yr. (1st sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
Changed graphics content	Modern curriculum /relevant curriculum to engage learners
Pupils ‘all doing different’ work/projects	Strength of new GCSE
Traditional team	Culture of individual actions
‘sing from the same hymn sheet’	‘make life easier’/ Line manger supportive
Changes at the same time	Scared some learners might fail
Networking	Looking outside school /like minded colleagues to work with

Figure 44: A summary of the issues and challenges that Lauren faced.

An individual analysis of Lauren’s profile highlights a set of issues and challenges that describe what she was doing to make meaning of the policy development (Bowden 2000). Practice problems for Lauren, in the present (Emirbayer and Mische 1998), focused on consistency, traditional

culture, curriculum planning, school systems, sharing expertise, and teaching through contexts, see Figure 44.

4.10 Mary

- **At the time of the interview:** Mary (Female) worked in a Local Authority City school with Low - Mid performance. The school had a high English as an Additional Language (EAL) cohort and D&T was situated within a Creative Arts Faculty. Mary was in her third year of teaching at her second school since graduating with a PGCE (masters credits). Her first-degree was in Fashion Knitwear.
- Mary taught textiles at KS3 and GCSE D&T (textile focus).

Figure 45: Demographic and contextual information relating to Mary.

Mary talked about 'massive changes' at her school. The department had gone through several iterations in recent years, see Figure 46. For example, she spoke about a new version of the carousel system being trialled every year. She had initially liked the carousel system of teaching each year group a material-specific project for a fifth of the year and had been apprehensive about the change to half-year rotations. This meant that a material area could be delivered to a different year group, depending where it fell each year. However, she saw that the shift to half-year rotations improved pupil progress in comparison to previous years. She also discussed how the shift in teaching groups for more extended periods allowed her to adapt teaching to her pupils' needs and develop confidence in her teaching. She also attributed her growing confidence to

her work with a whole school assessment group.

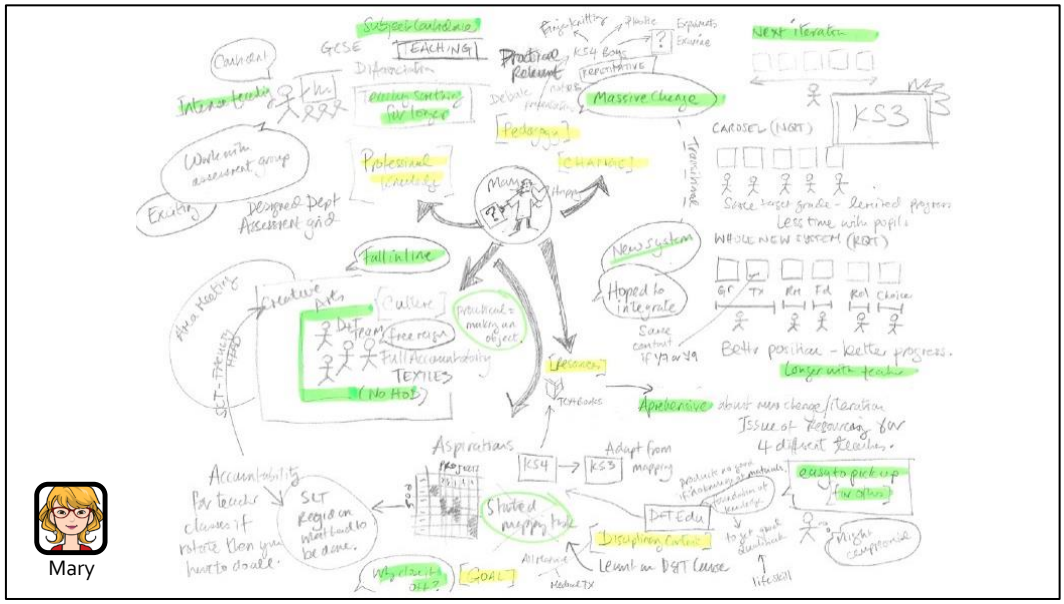


Figure 46: Visualisation of Mary's interview data.

Resourcing came up as an issue for Mary in relation to delivering material-specific content through a model that used non-textile specialist teachers. She felt that the content she usually taught would need to be adapted to these teachers and 'easy to pick up'. This would potentially compromise the resources previously used (by Mary) for practical learning activities that used active strategies because the teachers would not have specialist knowledge.

Mary also talked about the department structure and how the small team of four design and technology teachers were situated within a creative arts faculty with leadership from non-specialist design and technology teachers. Mary saw this as a problem when she used language like 'fall in line' to express the way the team felt that they had to conform to leadership decisions. She did not object to this as she felt that when teaching textiles she was given 'free rein' to do as she pleased. This

resulted in a different attitude to teaching the subject that appeared not to be shared across others in the design and technology team. She reasoned that this was due to Mary's approach to teaching the technical knowledge aspects of the curriculum through practical pedagogical approaches.

She asked 'why close it off' for her pupils, meaning that the study of design and technology as a single subject allowed for pupils to use any material they liked but also opened textiles up beyond fashion and interiors to medical textiles and architecture.

Mary F/T D&T
3rd Yr. (2nd sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
New versions of Carousel system - 'massive changes'	Improve pupil progress
'fall in line'	Creative arts faculty
Repeated teaching	confidence
Having 'free rein'	Teach differently to colleagues - modernise
Practical pedagogy	Helping pupils learn technical knowledge
Sharing expertise	Making resources "easy to pick up"
Joining school group	Dialogue/confidence

Figure 47: A summary of the issues and challenges that Mary faced.

An individual analysis of Mary's profile highlights a set of issues and challenges that describe what she was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on new version of carousel teaching, consistency, freedom, pedagogy, sharing expertise, and teaching through rotations, see Figure 47.

4.11 Mike

Mike SLT
7th Yr. (1st sch.)

- **At the time of the interview:** Mike (male) worked in a SAT faith school in a large city in the West Midlands. He had worked at the school for seven years since graduating with a PGCE (masters credits). His first-degree was in Design Prototyping and Technology.
- Mike continued his studies, alongside full-time teaching, and gained a masters degree in 2015. He is currently undertaking a NPQSL and is a member of SLT. Mike teaches across KS3, GCSE and A' Level D&T.

Figure 48: Demographic and contextual information relating to Mike.

Mike works within a small department. His account of translating policy reform into practice focused on issues and challenges with the resourcing of pupil projects, curriculum content, teaching environments and staffing, see Figure 49. He had a personal concern that the open nature of the GCSE contextual challenges - which he referred to as ‘projects’ – incurred a higher cost than previous practical work. The increase in funding he perceived to be linked to the need for pupils to explore open design briefs that could lead to a variety of solutions, including the use of large amounts of material, which he felt the department ‘can’t resource’. Mike also had concerns about the role facilities and equipment had in ensuring pupils achieved their target grades. He discussed how these would be compromised if equipment broke, was unavailable, or teachers went off sick.

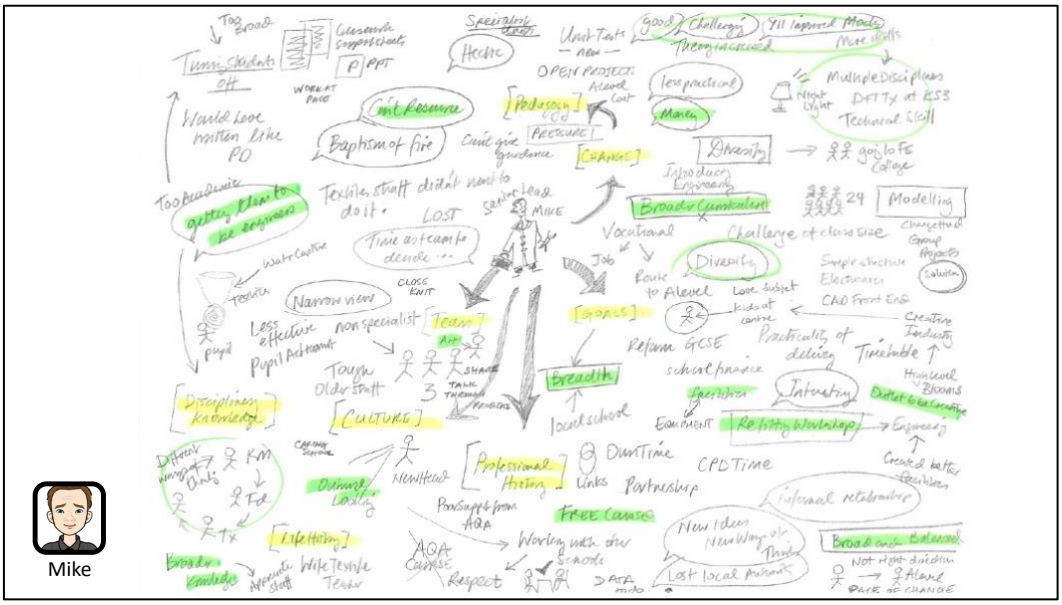


Figure 49: Visualisation of Mike's interview data.

Mike talked about how he wanted to make the department more diverse. A solution to the lack of equipment was a new refitting of workshops taking place in the summer. This would allow for the introduction of a new engineering GCSE. Mike was concerned that pupils were heading to study engineering at a local Further Education (FE) college. He hoped to reduce this effect by offering engineering alongside design and technology GCSE. This move was popular with the pupils that had wanted to work in the local engineering industry. Mike argued that the facilities would also benefit learners in KS3.

Mike talked about the fact that there was 'less practical' in the new design and technology GCSE. He was concerned that the new GCSE was too academic and too broad. This academic focus was a problem because it was 'turning pupils off' and 'getting them to be engineers'. He was also concerned that the new GCSE had reduced creativity. During another part of the interview, Mike talked about how the increase in theoretical content

had led to him using more ‘end of unit tests’ with his GCSE group. He saw this as a strength because the pupils felt this was a ‘good thing’ as it ‘challenged’ them and meant the subject was not just about making things. Mike also discussed the way that his use of the unit tests appeared to have resulted in his pupils making better progress and gaining ‘improved mock’ results.

Mike talked about how he enjoyed teaching across different material areas because this gave him broader knowledge which he could use to support pupils and appreciate his staff better. He was concerned to develop the KS3 projects so that they were ‘multidisciplinary’ and applied a variety of technical skills rather than projects in one material area. He identified problems associated with this in relation to offering open design briefs at KS3. He discussed the way he scaffolded the design projects at KS3 to accommodate a version of open design. Mike talked about how the different members of the team were less able to do this. He discussed age and training, reflecting on how his training offered opportunities to do some sessions in alternative material area specialisms. He did not see an issue with motivating team members (with a ‘narrow view’) to adopt multidisciplinary working, although he described the action as ‘tough’. He commented that textiles had been lost to art and design because ‘textile staff did not want to do it’ (the new design and technology GCSE). However, he also discussed his goal to get the department similar to a local school that offered GCSE with textile content.

Mike discussed how he uses some of his free time to visit local schools

and share resources. He was concerned that paid courses by exam boards were a problem. He discussed how the team had developed partnerships with other local schools where they go and share ‘new ideas’ and ‘new ways of working’. Mike returned to this topic later and debated the role that the subject association ought to play in this because the local authority no longer played a role in bringing schools and departments together.

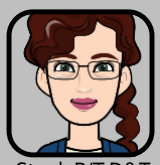
Mike SLT
7th Yr. (1st sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
Less practical	GCSE academic & broad
Equipment	Expensive/needed for pupil grades
Pupils exploring open design briefs	Variety of solutions
‘end of unit tests’/increased challenge	Reduced creativity
Multi-disciplinary projects at KS3	Prepare for GCSE
Introduce engineering	Diversity/stop pupils leaving school for another (local FE)
Developing partnerships with local schools	Bring schools together

Figure 50: A summary of the issues and challenges that Mike faced.

An individual analysis of Mike’s profile highlights a set of issues and challenges that describe what he was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on creativity, introducing engineering courses, pedagogy, resources, and sharing expertise, see Figure 50.

4.12 Steph



Steph P/T D&T
5th Yr. (2nd sch.)

- **At the time of the interview:** Steph (female) worked in a single-sex (girls), high performing, grammar school based in a small town. She was in her fifth year of teaching in her second school since graduating with a PGCE (masters credits). Her first-degree was in Textiles, Clothing Management and Technology and she had worked in industry.
- Steph worked four days a week and mainly taught food alongside other D&T subjects when needed.

Figure 51: Demographic and contextual information relating to Steph.

Steph's account of translating policy reform into practice focused on issues and challenges that included changes to year eight rotations, progression from KS3 to KS4, and local network meetings, see Figure 52. She framed her practice description around a perceived danger of lost material specialisms, her role in curriculum planning, and working with a head of department who did not appear to value the aspects of the subject that she taught. Steph talked about how the department had been 'late in the day' to address the actions required to implement the new design and technology curriculum. This delay with curriculum development was a problem for Steph because she felt that planning for textiles was under threat. She talked about the 'danger of losing textiles'. She discussed the need to teach textiles in a less 'outdated' way. For example, the department teaches a 'pyjama project', and Steph was concerned that this did not 'fall in line' with the new GCSE for design and technology. She

spoke about how the department was looking at introducing a change to year eight in the next academic year, which would see one teacher teaching across small material focused units of learning that lead to a small NEA type task at the end of the year. The detail for this was not yet in place. However, Steph discussed how the projects might adopt an approach that combined skills and materials. She gave the example that the team could change textile projects to provide opportunities for pupils to integrate material and skills through the manufacture of ‘tents and deck chairs’.

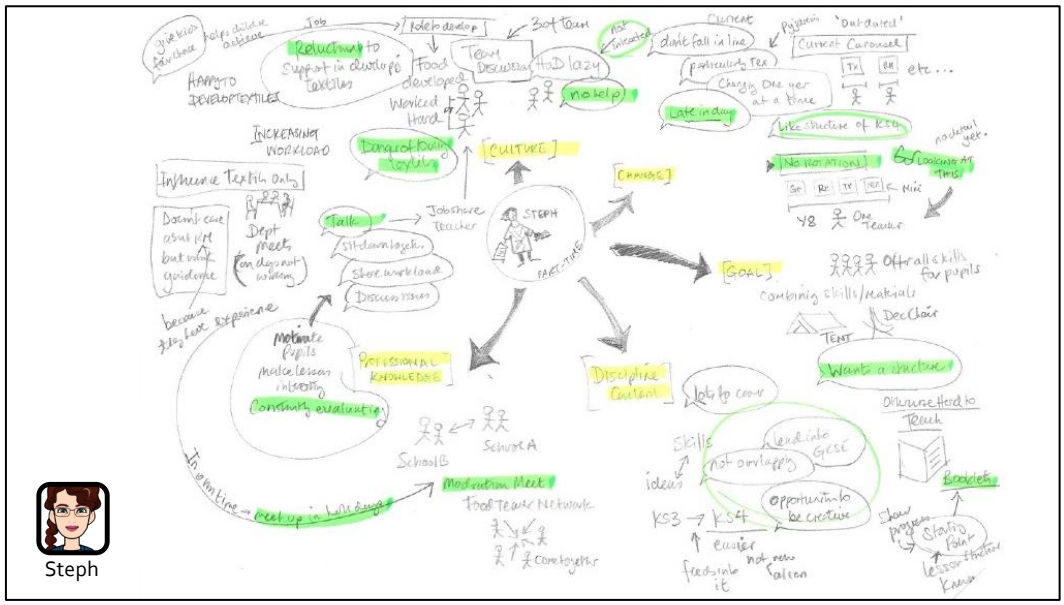


Figure 52: Visualisation of Steph’s interview data.

Steph talked about her head of department being ‘lazy’. This was a problem for Steph because it meant that he offered her ‘no help’ when she was needed to teach RM content. She discussed how she had worked hard to update and create resources for food lessons at KS3 and KS4, but now felt ‘reluctant to support the development of textiles’, unless the head of department and the other RM teacher provided a ‘structure’ for her to

use when teaching in RM. This was a concern around the future proposal to teach everything through a new 'no rotation' system the team were developing for the following academic year. She objected to doing her job when others did not do theirs. She discussed how this led to her arriving to teach in her non-specialist area and found that nothing was there to guide her. Steph went on to debate the pros and cons of using booklets but felt that as a 'starting point' they would support lesson structure and 'show [pupil] progress'. She continued to have misgivings about the RM teacher's role in preparing these resources for the whole team, but she was 'happy to develop the textile' element for them.

Steph talked about how the new curriculum plan for year eight was designed to give the pupils' 'opportunities to be creative' and ensure that the KS3 curriculum 'overlapped' with KS4. She thought that this would make it 'easier' for pupils to transition from one Key Stage to another and cause less of an 'alien' feeling about the new approaches used at KS4. She talked about how the change, which had the potential to make transition into the GCSE better, would also require the development of resources (booklets) to guide the teachers through the non-specialist material area projects. Steph talked about how she worked with another colleague in the department on food teaching. They both shared the food teaching in the department currently. Steph discussed how they shared the workload and would 'sit down together' and 'discuss issues' with the teaching. She discussed how this helped her with 'constantly evaluating' her practice. She was concerned to 'help children to achieve' and saw it as her job to do this. She talked about missing the school/department

meetings because they fall on her day off. She saw this as a problem, but she overcame the problem by meeting up with the other food teacher during the holidays. She also talked about moderation meetings that she attended, which she informally organised with teachers from other schools or went to ones organised by the Food Teachers Network (Food Teachers Centre, 2022).

Steph P/T D&T
5th Yr. (2nd sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
Updating SoW	Constant evaluation of practice
Share knowledge	Transition from KS3 to GSE is better for learners
Using booklets to scaffold lesson structure	Unconfident about team support in some material areas
Textiles in danger	'lazy' HoD = 'no help'
Working with other colleagues	Sharing workload
Changing year 8 next year & New rotations system	Need to modernise – 'fall in line' with new GCSE

Figure 53: A summary of the issues and challenges that Steph faced.

An individual analysis of Steph's profile highlights a set of issues and challenges that describe what she was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on curriculum planning, textiles, resources, sharing expertise, and a new rotation system, see Figure 53.

4.13 Vicky

- **At the time of the interview:** Vicky (female) worked in a co-educational faith Single Academy Trust (SAT). Vicky was in her forth year of teaching at her second school since graduating with a BSc (Hons) Secondary design and technology Education degree.
- Vicky works full-time and teaches across all key stages. She also had a school-wide responsibility for homework, which gave her teaching and learning responsibility (TLR).

Figure 54: Demographic and contextual information relating to Vicky.

Vicky's account of translating policy reform into practice focused on issues and challenges that included staffing, curriculum content, and planning, see Figure 55. For example, Vicky talked about using a rotation system that taught the pupils through six different projects with six staff. Three of the staff were specialists, but three were not. Having non-specialist staff was a problem because Vicky felt this was 'not the best', and pupils tended to be 'missing knowledge of key terminology' after learning with a non-specialist teacher. However, she debated that this was better than the previous year when the three teachers had been forced to teach the pupils in much bigger groups to meet health and safety regulations. This had led to fewer practicals within the adapted curriculum for bigger teaching groups.

Vicky went on to talk about initially 'stabbing in the dark' with the new content. She was concerned that the curriculum was 'big' and that pupils

needed to ‘learn about loads of different materials’. She debated how this was great for the pupils because they got to experience electronics, plastics, wood and maybe metal, which allowed them to feel like they ‘can do whatever’. However, this meant that problems had arisen because she (their teacher) did not know everything. Vicky did not say she objected to the extra work (on her part) because she felt it was an experience ‘like the students’ - she too would learn all the different materials alongside them.

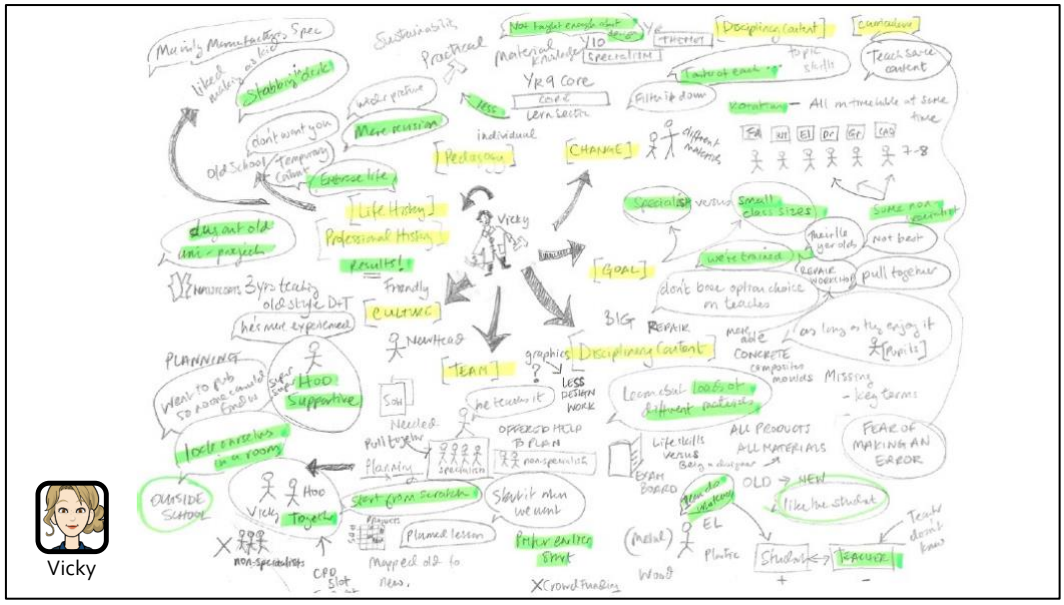


Figure 55: Visualisation of Vicky’s interview data.

Vicky mentioned how she had to ‘start from scratch’ with the planning, which she undertook with the head of department. She discussed how the two of them planned together by mapping the old curriculum to the new curriculum. She did not mention the broader team. She discussed how they had had to go to the pub to plan ‘so no-one could find us’. Vicky explained that her office was in the same room as the printer, which led to distractions. Vicky talked about how the group planning helped with her ‘fear of making an error’ with her pupils’ learning and the knock-on effect

of poor results because she and her head of department would both ‘teach the same content’.


Vicky F/T D&T
4th Yr. (2nd sch.)

Practical Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
Non-specialist/specialist team	Pupils ‘missing knowledge and key terminology’
Teaching through 6 rotations	Non-specialist/specialist team
Old curriculum mapped to new	Increase in GCSE content
Developing new content 'start from scratch'	Pupils 'learn about loads of different materials'
Teacher lacks knowledge 'stabbing in dark'	Teacher’s learn alongside pupils
Plan with others	Fear of error' 'teach the same'
Plan off site	Avoid distractions

Figure 56: A summary of the issues and challenges that Vicky faced.

An individual analysis of Vicky’s profile highlights a set of issues and challenges that describe what she was doing to make meaning of the policy development (Bowden 2000). Practice problems in the present (Emirbayer and Mische 1998) focused on curriculum planning, teaching environment, non-specialist teachers, sharing expertise, teacher knowledge, and teaching through rotations, see Figure 56.

4.14 Summary

In summary, the participant interviews mapped my areas of interest in:

- policy translation into day-to-day practice;
- issues and challenges experienced;
- responses to the challenge;
- teacher agency.

The individual profiles generated data that described the teachers' experiences of policy reform and how they responded to the current 'knowing' era iteration. Using the demographic information, rich picture and textual description, I was able to 'dwell on the participant's experience and develop emphatic understanding' (Ashworth and Lucas 2000, p. 304) to support my interpretation of the teachers' practice focus and frames of reference. The individual descriptions develop knowledge to answer the research question:

- what are the specific issues and challenges that design and technology teachers face when translating policy development into practice?

The individual profiles reveal the main issues and challenges for teachers (see summaries at the end of each profile for an overview of all issues/challenges) including:

- sharing expertise (also talked about in terms of networking and partnership);
- 'coming off the circus' (also talked about in terms of teaching across specialisms and the pupils staying with one teacher for the year);
- curriculum planning (also talked about in terms of mapping curriculum, top-down planning, and 'start from scratch');
- resources (included the use of commercial textbooks, equipment, environments and planning);
- teaching content (including conversations about maths, contexts

and A-level at GCSE).

The individual profiles provide internal validation through the contextual meanings that can be drawn upon as I progress to the thematic analysis and comparison of experiences across cases (Ashworth and Lucas 2000, p. 304).

Chapter 5 Themes across the data

This chapter reports the findings from the thematic analysis (Gibbs 2018 and Saldaña 2013) and phenomenographical categorisation (Marton 1981, Bowden and Walsh 2000, Patrick 2000). The chapter is divided into four main sections. The first three sections report a set of themes that capture the similar issues, challenges and responses experienced by the teachers. The final section uses the thematic analysis and individual profiles to provide a hierarchical typology of statements that highlight a limited set of descriptions to synthesise the design and technology teachers' approaches to the translation of policy into practice. This chapter reports the thematic analysis and categorisation that I have developed to describe these teachers' shared and diverse experiences and conceptualisations of policy translation.

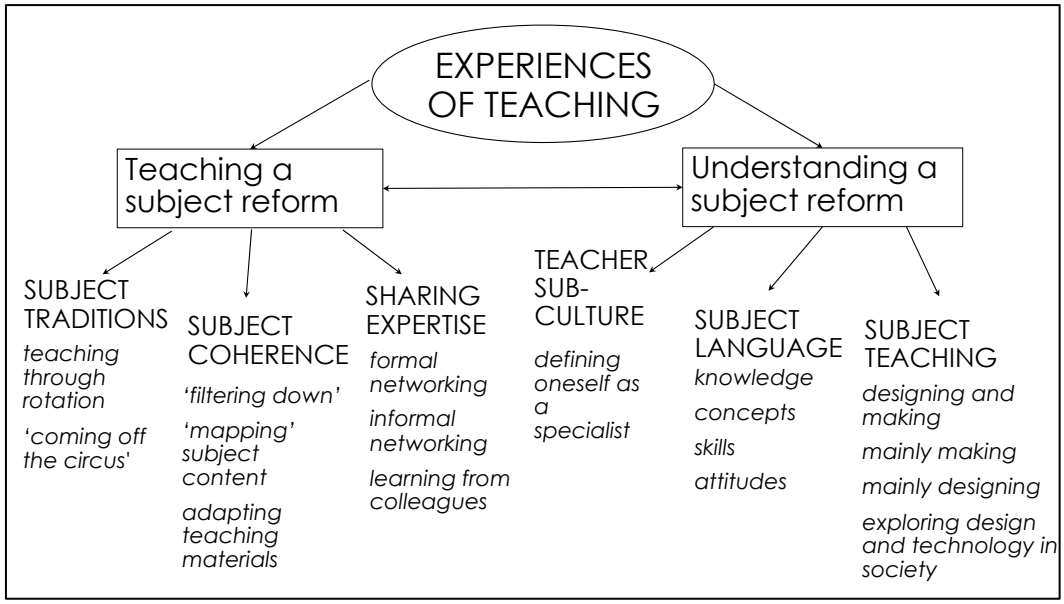


Figure 57: Map of themes across the data.

The first two sections describe the overarching themes: *teaching a subject reform* and *understanding a subject reform,* see Figure 57, The third

section describes an additional set of minor themes. The themes discussed here build on and add to the common ideas within the individual design and technology teacher profile data, see Table 6. The first three sections continue to contribute answers to the two research questions:

- what are the specific issues and challenges that design and technology teachers face due to current policy development?
- what experiences influence teachers' responses to the challenges this specific policy development brings to established practice, focusing on their agency?

Practice focus - issues and challenges (Individual design and technology teacher profiles)	**Thematic analysis – themes**
'coming off circus'	'coming off circus'
Curriculum planning/teaching lots of content	'filtering down' subject content
	Mapping subject content
	Adapting teaching materials
Resources	-
Sharing expertise	Formal networking
	Informal networking
	Learning from colleagues

Table 6: Common themes across the individual profiles and collective thematic analysis.

The final section draws on the phenomenographical approach to analysis (see Chapter 3). The section reports a limited set of concepts that describe how these teachers conceptualised their actions in response to policy development. The findings in this section contribute to the overall

research objective:

- to investigate the qualitatively different ways design and technology teachers translate policy development into practice.

To highlight the themes across the data, *italics* have been used to represent a code name. For example:

- *subject traditions*.

Direct quotes from participants are referenced by the individual teacher and indented. Where 'speech marks' have been used within paragraphs, this relates to direct quotes from teacher extracts. For example:

- 'rotation'.

5.1 Teaching a subject reform

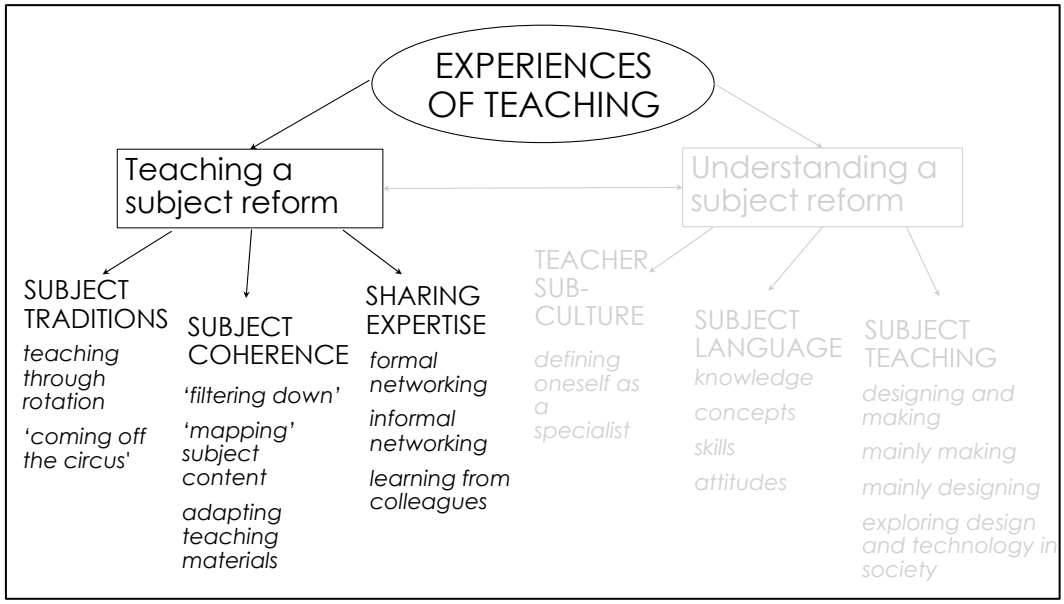


Figure 58: Map of overarching theme – Teaching a subject reform.

5.1.1 Subject traditions

The theme *subject traditions* explores the participants' approaches to the issues and challenges that design and technology teachers face as a consequence of a subject development and change. The theme is classified into two sub-themes: *teaching through rotation* and *'coming off the circus'*, see Figure 58. Charlie's comment below sums up the tension between the *subject traditions* of teaching in a specialism (see Chapter 2) and actions that generate new traditions that support policy reform goals (Department for Education 2013, 2016):

> *We all have specialisms, I would say, but we're all very much capable of adjusting; going right, I'll do a bit of graphics. Although I teach mainly engineering, I think when I started my practice, it was graphics and resistant materials (Charlie).*

5.1.1.i Teaching through rotation

The sub-theme *teaching through rotation* captures the participants' experiences of teaching in their main material area specialism. *Teaching through rotation* involves practices and expectations (Goodson 1998) that relate to a set of defined material area specialisms covering specialist knowledge and skills, including specialist knowledge of designing, making, and evaluating. Teachers teach a different group of pupils for a part of the school year, which might be a half-term, term, or half-year in length and cover the material area specialism content. They teach the material area specialism content to a different group of pupils at different points in the school year and teach every pupil within a year group. The thinking

behind this teaching model is that pupils benefit from working with a specialist teacher and the curriculum can be organised in ways that allow teachers to work within their specialism – not unlike the CDT circus described by Penfold (1988). *Teaching through rotation* is in contrast to the practice of *'coming off the circus'*.

When *teaching through rotation,* participants frequently talked about teaching through a series of projects that were not taught as a linear set of learning that build one on from the next, but a series of independent projects that are taught when the teacher is available. In a rotation system, teachers divide the curriculum into projects that cover fields of knowledge (Winch 2013) related to a defined material area. Deborah's comments below sum up the practice of dividing the subject:

> *what we have done for years seven and eight is split them into half terms, [...] there are five projects in year seven and five in year eight that cover the majority of material areas. And the majority of the knowledge. Just the basics of the knowledge that they need to know at Key Stage Three (Deborah).*

This extract demonstrates that this teacher's department organise the curriculum into short projects that focus on a different material area aspect of multi-disciplinary subject content (Hardy 2020). The annual repetition of these short projects requires the teachers to focus on building learners' design and technology subject knowledge in one material area at a time. This type of project limits the time each teacher spends with one teaching

group, to the length of a project (one half term equals six – seven weeks). Teacher pupil relationships require time to develop (Ofsted 2008, 2011). When talking about how the rotations change over time, Charlie explains that pupils:

> *do seven weeks in each rotation area [...] then in year eight, they'll do all of them again, but in a different project context, and then building on what they'd learnt previously. Then it goes up again to year nine, and we try and build in a little bit more rigour in terms of what we're expecting and the quality of what they're doing (Charlie).*

This comment shows that Charlie's experience of curriculum organisation is based on a 'rotation' of different project contexts. In his school, context stands for a different material area within the CDT circus (Penfold 1988) rather than the domestic and industrial contexts of the new National Curriculum orders (Department for Education 2013, 2015b). Charlie perceives each rotation as a cyclical unit of learning that builds context specific design and technology subject knowledge. He understands this as his responsibility to develop units of learning that align with notions of a spiral curriculum (Bruner 1966) within one material context. Teachers manage *teaching through rotation by* taking responsibility for the Key Stage projects related to one material area. Individual teachers plan a project, as a unit of learning that can be taught at any point in the year, and focuses on a defined material area. When talking about the benefits of *teaching through rotation,* Kerry talks about his current teaching model

when he comments:

> *[...] the students rotate around specialisms and the specialist teacher because that was something I felt was really important (Kerry).*

His comment implies a judgment about the importance of subject specialist teaching compared to the development of teacher pupil relationships. Relationships that might support pupil development of design and technology knowledge. Participants linked specialist teaching accountability and individual responsibility in terms of material area specialism content – reducing subject boundary-crossing (Darby 2006, Mizzi 2021). For example, Mary's comment below sums up the division of curriculum responsibility when *teaching through rotation:*

> *Yeah, I'm the only person doing textiles. So I've had full accountability for what I've written for the textiles scheme of work. And the food teacher has had full accountability for her [area], and the robotics and the RM staff have had the same for theirs (Mary).*

Not all participants' data fitted neatly into *teaching through rotation or 'coming off circus'.* When talking about rotation teaching models, Andy comments:

> *we stay with the groups, we don't rotate them out; we do a carousel sort of system through different projects, but we*

> *don't rotate our teachers for like food and textiles. So, the kids go over to food and textiles, and then they come back and then, you know, other teachers will do graphics and resistant materials (Andy).*

Andy's comment describes the external practice of one teacher 'stay[ing] with' one group, whilst the content pupils learn is rotated. However, he also describes a hybrid version of this practice in which teachers only stay with one group when teaching either KS3 food and textiles, or KS3 graphics and resistant materials. The phrase 'go over to food and textiles' implies a separation between the physical spaces of these different aspects of the subject. Aspects that have been historically linked to CDT bias (Penfold 1988). Thus, Andy judges 'stay[ing] with' one group to only apply to teaching and learning that is representative of traditional boys crafts-based lessons and CDT leading to a hybrid version of *'coming off the circus'* that has strong links to *teaching through rotation.*

5.1.1.ii 'Coming off the circus'

The sub-theme *'coming off the circus'* captures the participants' experiences of teaching outside their main material area specialism. The theme *'coming off the circus'* involves teaching the subject as a single subject (Department for Education 2015b) by covering core topics, including knowledge of different material areas. Teachers teach one set of pupils for the whole school year and cover all subject knowledge required. They might swap to a different group of pupils from year to year or teach the same group of pupils over a Key Stage. The thinking behind this

teaching model is that pupils benefit from working with one teacher for the year and will be better prepared for learning at KS4, which requires this single-subject approach. This is in contrast to the practice of *teaching through rotation*. Steph's comment below captured the plan to shift from *Teaching through rotation* to *'coming off the circus'* when she commented:

> *Okay, so they wouldn't work on a rotation scheme like we've been doing. They'd have one teacher that would see them through the graphics work, some textiles work and some RM work (Steph).*

This extract demonstrates that one teacher teaches the class for a year. Teaching the same class for a year supports pupil progress related to raising achievement (Department for Education 2010). When talking about the shift to a new approach of teaching through longer rotations, that keep teachers with the same group of pupils for a longer period of time compared to previous delivery models, Mary reflects that:

> *from my position, I feel like the year 9s are the strongest year 9s that I've seen in school since I've been teaching there (Mary).*

This comment shows how Mary justifies the shift to longer rotations for specialist teaching as beneficial to learners development of subject knowledge (Department for Education 2010). The practice of longer rotations forced Mary to practice something that did not align with her goals, however, the experience helped her realign those goals once she

witnessed the impact on pupil progress. For example, when talking about the shift to staying with pupils for a whole year, Judith comments:

> *to track the progress, we felt it helped to keep the kids for the year, and we even tried to keep them for two years here, which I thought's nice [...] I've got one group who I have had since year seven who are now doing their options in year eight - everyone in my class is taking D and T at GCSE (Judith).*

This comment shows that teaching one group of pupils for the whole school year supported organisational issues like monitoring pupil progress and the additional benefit of making GCSE options in the subject more desirable. However, the shift to *'coming off the circus'* requires material area specialist teachers to cover core topics, including knowledge of different material areas. Vicky's comment below sums up the breadth of subject knowledge that one teacher needs to be able to cover when she comments:

> *[...] one day teaching about woods and the next day teaching about metals and then the next day teaching about textiles. [...] the only kind of bad thing is that we as teachers need to know about everything and then specialise in one [at GCSE], a bit like what the students have to do. So, if you have gone from old [previous curriculum] to new, then you have got to learn about loads more stuff to then be able to*

teach it. I have had to dig out all my textiles projects from Uni[versity] (Vicky).

The logic of a comment like this would be that teachers need to teach everything that pupils are expected to learn under the subject heading - design and technology regardless of how diverse the content may be (Archer, Baynes and Roberts 1992). This sub-theme highlights the diverse range of knowledge that design and technology teachers are expected to develop during their pre-service training or work.

5.1.2 Subject coherence

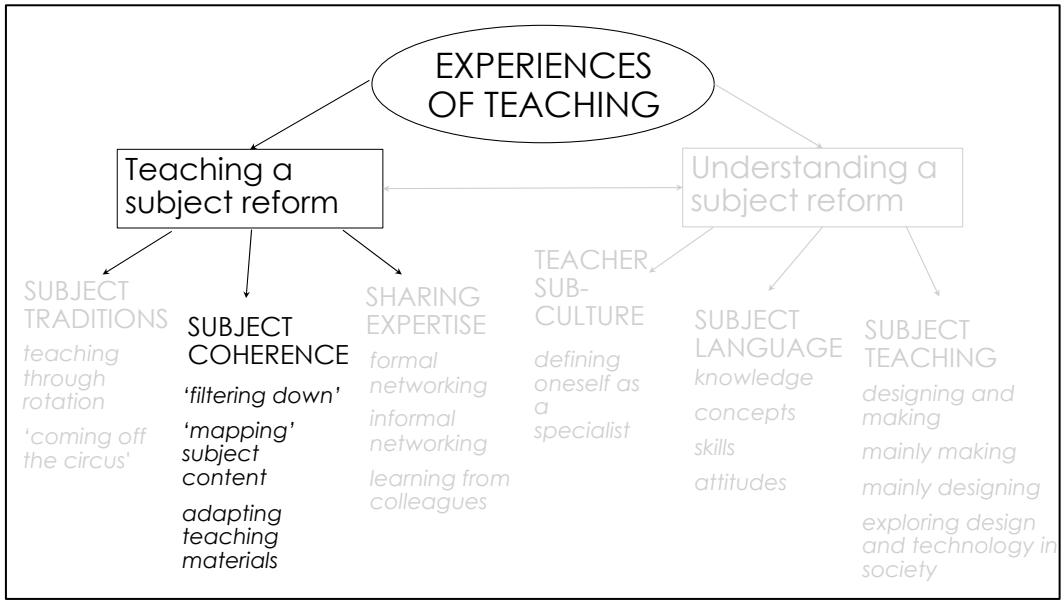


Figure 59: Map of sub-theme – Subject coherence.

Subject coherence explores the teachers' different experiences and understanding of planning a subject change. *Subject coherence* captures data related to the teachers' different approaches to curriculum planning (see Chapter 4). The data is classified within three sub-themes: '*filtering down', 'mapping' subject content* and *adapting teaching materials*, see

Figure 59.

5.1.2.i 'Filtering down'

The sub-theme *'filtering down'* captures the participants' experiences and thinking in relation to planning a curriculum change by including subject content to be covered at KS4 down to the KS3 units of learning. Participants refer to 'top-down', 'filtering-down' and 'mini-NEA' (small GCSE coursework projects at KS3) when describing this type of planning. For example, Vicky describes the practice of *'filtering down'* by changing KS3 to mimic KS4 and giving pupils a sample of what is to come when she comments:

> *We have tried as much as possible to kind of filter it down and just give them a taster of each topic area and try to give them skills, so that when they come to us in year 9 - because our Key Stage 4 is year nine to 11- we have got some basic skills to kind of be able to manipulate into GCSE standard (Vicky).*

This comment shows that the teacher wants to scaffold pupils' understanding of subject knowledge and skills by changing KS3 practice to align with KS4 and therefore, raise achievement (Department for Education 2010). The new GCSE and learning at KS4 requires pupils to develop technical and design knowledge (Department for Education 2015b). When talking about the shift away from projects that result in a material area specific product, Steph comments:

> *We are updating each year group. We're changing it to be more like the structure of the Key Stage 4, where they'll do some skills work in three areas, and then they'll do a mini NEA (Steph).*

and Lauren comments:

> *we have tried to introduce newer projects that the students can relate to but also covers more of the GCSE content. [...] next year, we're going to be looking at how we can introduce examination type language and metacognition into all Key Stages - and looking at math[matic]s (Lauren).*

This extract demonstrates that GCSE policy change drives change in the classroom, this is because being successful is perceived to be linked to GCSE attainment (Department for Education 2010) through a return to contextual research (Department of Education and Science 1987). Participants frequently link GCSE grades to success in the subject. However, this comment from Mary highlights the thinking behind a curriculum designed to support the progression required:

> *to help the children get better at the subject, they have to have that foundation of knowledge to be able to sort of build on and make them successful (Mary).*

5.1.2.ii 'Mapping' subject content

The sub-theme *'mapping' subject content* captures the participants'

experiences and thinking in relation to planning a curriculum change by working as a team to collectively identify the parts of the curriculum that get covered by each unit of learning or project. Teachers come together to review existing plans and identify where core subject knowledge is being taught or missed out within teaching plans and resources. By mapping out the curriculum, participants think that they will get less repetition of knowledge and skills across the different projects and find out what they are not teaching. In addition, they feel that this is a good way to ensure there are no ‘gaps’ in their planning and that all pupils get a ‘consistent’ experience of the subject at KS3. This contrasts with the sub-theme *teaching through rotation*, which implies a lack of consistency due to the individual nature of planning aspects of the curriculum in isolation to other aspects.

Participants frequently describe the activity of *‘mapping’ subject content* in relation to subject change. For example, when talking about the subject change requirements, Charlie comments:

> *we're starting to look at the curriculum and planning out a curriculum what we're covering in each project [...] we've found there's quite a lot of crossover. Somebody would be assessing the design task, and then they go into the next rotation, and they're assessing another design task, [...] so we try to map the curriculum against what needs to be covered as much as possible, and go look we've repeated this too many times. By the time they get to the fourth*

> *rotation, do they really need to do another health and safety lesson? Can they be doing something else in that lesson? (Charlie).*

This is suggesting that Charlie believes that pupils ought to experience a curriculum that is the best it can be (Young and Muller 2013). The process of *'mapping' subject content* avoids repetition and identifies when and where core subject knowledge is missing (Winch 2013, Ashbee 2021). For example, when talking about the practice of *'mapping' subject content,* Deborah comments:

> *we have done that quite a few times, getting the new GCSE into the curriculum and looking where the gaps are where the Key Stage 3 projects fit in; looking at the requirements of them. [...] this year, for the sevens and eights, the projects across the two years should cover the majority of the areas that are needed in the GCSE (Deborah).*

Again a comment like this is saying that *'mapping' subject content* avoids repetition and identifies when and where core forms of subject knowledge and skills are missing to give pupils a strong foundation for KS4 teaching and learning (Ashbee 2021). This sub-theme links to '*filtering down'.*

Participants frequently describe the importance of consistency once a curriculum has been mapped. However, some flexibility is allowed in so far as teachers meet the unit of learning aims. Vicky's comment below sums up the nature of a collective approach to *'mapping' subject content*

that allows individual interpretations of teaching methods based on expertise within the department (Hargreaves 2005):

> *there may be a bit where I planned, and then my head of department might skip over that bit. He might already know a better way to teach it because he has more experience than I have (Vicky).*

5.1.2.iii Adapting teaching materials

The sub-theme *adapting teaching materials* captures the participants' experiences and thinking concerning planning a curriculum change by altering existing teaching plans and resources. Participants frequently talk about ‘re-planning’ and ‘tweaking’ existing teaching. Teachers go about *adapting teaching materials* by modifying their existing teaching plans to meet the changes required to those identified due to *mapping subject content*. They think about these adaptations as adding breadth and generating greater alignment to the subject change. In addition, teachers feel that this adaptation of existing teaching resources can be accomplished within the timescale because planning from scratch might be time-consuming. When talking about *adapting teaching materials,* Hetain describes the practice of modifying existing planning when he comments:

> *we felt there was scope to adapt and tweak the resources, and the scheme of learning, and the lesson plans we had in place so that we could roll it out to the students (Hetain).*

and Mike comments:

> *I say we have had to try and tweak a lot of the projects that we deliver to the students to obviously cover a broader range of material areas, which is a positive (Mike).*

This extract demonstrates that existing teaching materials – projects – can be altered and adapted to meet new aims. However, the practice of adapting teaching materials is not entirely linked to the subject change because participants frequently talk about the ongoing work of reviewing and updating curriculum plans through self-reflection (Buchanan 2015). For example, Kerry's comment below sums up the nature of this ongoing practice of *adapting teaching materials:*

> *So, it did mean re-planning schemes of work it has meant, you know, re-planning work booklets and things like that. So that we've got so there a constant like a constant upgrade, I am upgrading now for next year, and I am trying to still change what I'm doing (Kerry).*

5.1.3 Sharing expertise

The theme sharing expertise explores the participants' approaches to ongoing professional development needs concerning learning new knowledge and skills; and planning, monitoring and evaluating teaching (Douglas 2011, 2014). The theme is classified into the following sub-themes: *formal networking, informal networking*, and *learning from*

colleagues, see Figure 60. Lauren's comment below sums up the reciprocal nature of the theme: *Sharing expertise*.

> *I think because I'm prepared to share resources and ideas with them [others in the network], then they're more likely to support me when I need it. [...]. I just think if you don't network, you've got no chance (Lauren).*

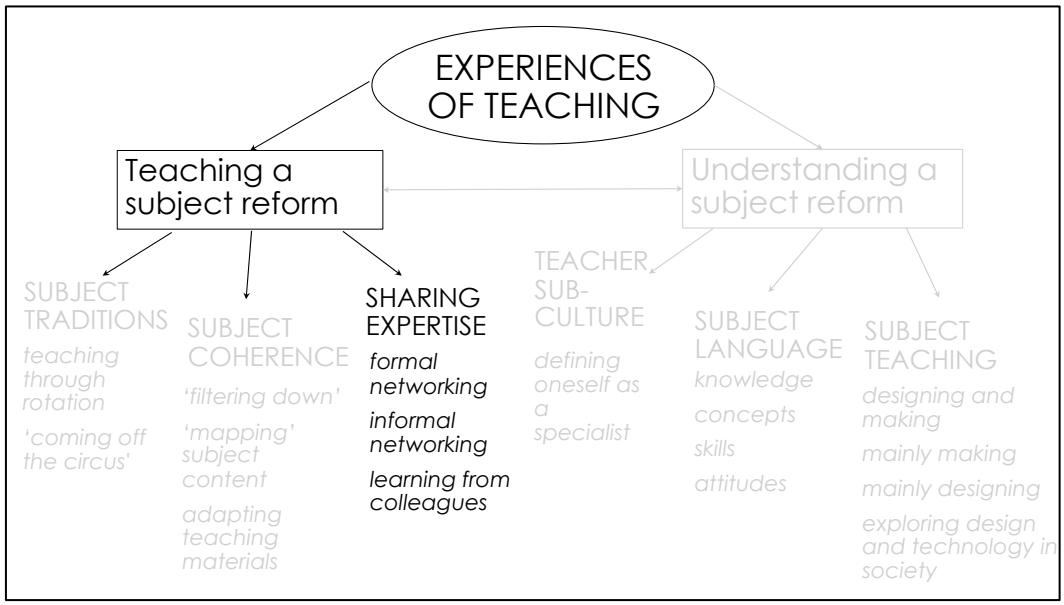


Figure 60: Map of sub-theme – Sharing expertise.

5.1.3.i Formal networking

The sub-theme *formal networking* captures the participants' experience of interacting with others to exchange information and ideas from professional contacts within the Academy Trust. These networking activities are imposed and part of a teacher's contract to support common classroom and organisational approaches across the Academy Trust. Kerry describes the shape and purpose of the meetings when he comments:

> *All the Trust schools [...] we all meet once a half term. We either meet for moderation, or we meet to discuss teaching and learning or what's happening in the subject. What we need to account for; share best practices. It's normally led, it's led by someone at School B. [...] from there we take things back into our own departments (Kerry).*

The exchange of knowledge to support common classroom and organisational approaches (Goodson 1998) can also be used to reassure teachers. When talking about networking interactions that reassure, Hetain comments that:

> *there's an element of pressure in that [...], not knowing 'Are we on the right track? Are we not on the right track?' And I think that goes for all schools because recently we had a moderation exercise where [a] few different schools came into school to kind of compare the NEA component examples from their school. We had examples from our school. And we felt that we were in a better position in comparison to what we had [thought] (Hetain).*

This extract demonstrates that interactions with professional contacts working at different schools can help to alleviate fears about how new subject implementation is going, whilst supporting patterns of 'on the job' training (Department of Education and Science and the Welsh Office 1989). However, the exchange of knowledge to support or reassure is not

always appreciated. For example, when talking about her experience of *formal networking* across the Academy Trust, Alison reflected that:

> *the other heads of XX City are, they're not brilliant Heads of Department, and their results are absolutely shocking. [...] they're not quite on the same page as me in terms of attitude to getting the best out of every child (Alison).*

Her comment that the other Heads of Department are 'not quite on the same page' shows that not all shared experience is viewed as positive. Alison's values appear to clash with the values of her colleagues (Giddens 1994). She separates herself from the other Heads of Department. A pattern that can be seen in her work context – sole teacher of KS4 (see Figure 22, in Section 4.2).

5.1.3.ii Informal networking

The sub-theme *informal networking* captures the participants' experiences of interacting with professional contacts to exchange knowledge and information about teaching the subject change. When teachers work in schools that they perceive to lack the subject expertise required to implement policy reforms, they seek out other professionals with that knowledge from whom they can learn. For example, Andy describes his visits to other schools to gain information about teaching engineering when he comments:

> *I visited quite a few schools around [...] not all of them do engineering, but *School X* particularly, have always had a*

> *very strong sort of engineering, sort of pedigree they have a young engineers club that's very successful and that type of thing (Andy).*

This extract demonstrates Andy's perception that 'successful' schools in an area he wants to develop knowledge in are a good source of expertise. A source of expertise that can support teaching outside a specialism (Thornton 1995, Darby 2006, Childs & McNicholl 2007, Morgan & Bourke 2008, Chapman, Wright & Pascoe 2020, Sani & Burghes 2022). When talking about *informal networking* opportunities Mike described his use of family and local contacts to develop 'partnerships' that scaffold knowledge exchange:

> *my wife works at a local school, she is a design and technology teacher too at a local school [...], and that's a good way of getting, you know, new ideas, new projects, new ways of thinking about developing the subject because, we have obviously lost all of the kind of local authority support, we once had (Mike).*

This comment shows that professional support from the local authority is no longer available. A situation that can be contextualised by the school where Mike works (see Figure 48 in section 4.11). He works in an Academy Trust which no longer receives funding from the local authority. Mike appears to be unaware of this and uses his past experience of local authority networking events to bring his nearby contacts together

(Buchanan 2015). Contacts that may share the same issues and challenges (Goodson 1998). For example, when Lauren talks about *informal networking* she focuses on the reassurance that this activity provides, because she wants to access support that she feels is missing from within her school, Lauren comments:

> *linking with other colleagues [...] makes you feel less isolated. That you're not doing something wrong, it's nice to know that it's not […] although they've got more teaching experience than you, it's nice to know that everybody's having the same problem (Lauren).*

Her comment highlights that reassurance from others is an important factor in not feeling alone with subject issues and problems. Lauren goes on to comment that the network introduced her to another teacher who 'thinks along the same lines', and she is now interacting with them at a planning level.

5.1.3.iii Learning from colleagues

The sub-theme *learning from colleagues* captures the participants' experiences of sharing their specialism knowledge with others in exchange for new learning. This sub-theme links to the sub-theme *defining oneself as a specialist,* which explores participants notions of specialism and how their professional role is linked to the work they do.

The sub-theme highlights the way participants validate their lack of expertise in one specialism with their expertise in another through

dialogue and collaboration within the school environment. For example, when talking about learning from other colleagues within the department, Charlie comments:

> *She's almost like my work mum, and she's just there going, 'you don't need to do that, you can do it this way, or you can do it that way'. Whereas I think I'm not offended by that, I would say to her, 'if you think I'm doing something wrong, just tell me'. Whereas if it was the opposite way round and she was in my material area, I'd be just as understanding and wanting to share, let's say like, professional development within the department (Charlie).*

The logic that informs a comment like this is that *learning from colleagues* is perfectly normal if the learning is not related to your own defined material area forms of knowledge (Ashbee 2021). This is because you can offer the same exchange of expertise at a later date. Exchanges of expertise are managed through the classroom or meeting times, continuing the tradition of 'on the job' training (Department of Education and Science and the Welsh Office 1989). When talking about using meeting times to interact with colleagues and exchange knowledge and skills required to be flexible and teach the new subject content, Judith describes her experience of prioritising *learning from colleagues* when she comments:

> *Here we have two staff meetings a week [...] one on a Monday and then on a Wednesday. [...] as a department, we knew obviously, we wanted to be flexible and be trained in all these different areas, so, we decided, right we're going to use that Wednesday (to teach each other) (Judith).*

Here again, the idea that *learning from colleagues* is a way to support teachers that want to be 'flexible' and teach outside their specialism (Thornton 1995, Darby 2006, Childs & McNicholl 2007, Morgan & Bourke 2008, Chapman, Wright & Pascoe 2020, Sani & Burghes 2022). Participants see the notion of *'coming off the circus'* as a requirement for teaching the subject change (Department for Education 2013, 2015b). Even when opportunities for *learning from colleagues* have not been organised, participants imagine new practices that promote *learning from colleagues*. For example, when talking about *'coming off circus'*, Steph comments:

> *We've got two INSET days in September. And I would imagine we will use some time within that where we'll be giving the two men that teach graphics and RM some guidance in textiles, because they've never done that. And then hopefully we'll spend some time with them in the workshops and have a look at what we're teaching with them. That'll be the plan whether it happens or not is another matter (Steph).*

This comment shows that teachers with different material area specialisms need guidance from a more knowledgeable other (Vygotsky and Cole 1978) about how to teach the new material area. This type of knowledge exchange encourages dialogue amongst colleagues (Giddens 1994). When talking about learning needs, Kerry comments:

> *Yes, I had to find answers learn more content, make new resources, it's encouraged collaboration with the department because I'll go to other staff for advice as well (Kerry).*

This extract implies that *learning from colleagues* encourages teamwork and supports departmental relationships. Teamwork that promotes informal dialogue between colleagues outside the working day.

In addition, participants also talked about using commercial curriculum materials to support learning in their teams as an example of *learning from colleagues*.

5.2 Understanding a subject reform

5.2.1 Teacher sub-culture

The theme *teacher sub-culture* explores participants' approaches to the idea of specialism within design and technology. The theme captures participants' experiences and thinking about how they view themselves as teachers and understand their work, see Figure 61. Participants describe themselves as specialist teachers. Specialist teachers teach an aspect of design and technology that relates to a defined material area. They

generally have background expertise and qualifications in that aspect and limited knowledge and skills related to another aspects from outside their specialism (Darby 2006).

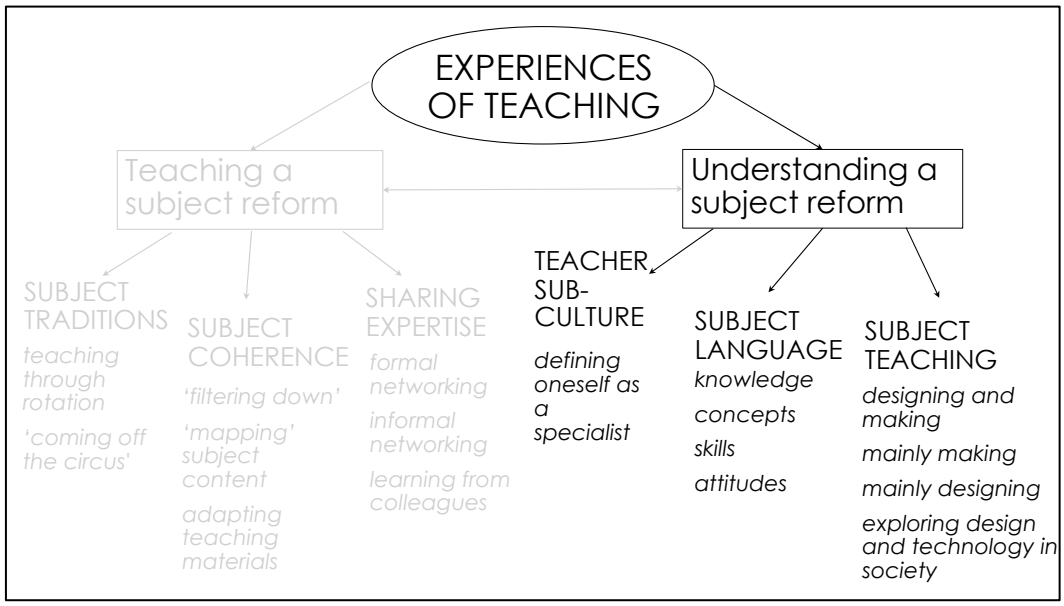


Figure 61: Map of overarching theme – Understanding a subject reform.

The naming of oneself as a specialist is related to a teacher's first degree, employment history and/or planning responsibilities. *Teacher sub-culture* links to *subject traditions* and the way teaching is divided into material topics, see Figure 61. Participants frequently describe themselves and those they teach with by their specialist title as we can see in the following comment from Vicky:

> *we've got an electronics specialist teaching the electronics, and a specialist teaching the resistant materials side, and we have got a CAD topic, which isn't taught by a specialist (Vicky).*

This extract demonstrates that teaching a defined material area requires

specialist knowledge and skills, however, ‘CAD’ (computer aided design) does not require specialist knowledge. A specialist teacher not only has a PGCE in design and technology but a first-degree in one of the defined material areas (Bell 2015). When talking about how teaching gets allocated to teach specific material areas, Charlie comments:

> *I did it [first degree] in architecture, so I was thinking yeah graphics that would be perfect for me. Then my first job was construction and graphics, so I felt quite comfortable. I got a bit of graphics and a bit of construction I was quite confident in that from my degree. Then they asked me, can you pick up some resistant materials? I was like, yeah, I can pick up that, so I did a bit of that (Charlie).*

This comment shows that a teacher's specialism can be linked to their first-degree initially then related to teaching experiences (Douglas 2011, 2014). Teaching experiences that might be limited due to planning responsibilities. For example, when talking about developing teaching experience beyond first-degree background, Steph comments:

> *primarily my teaching job is food. That's what I was employed to do. [...] Personally at the minute, I'd quite like to keep teaching food. Well, there were two of us joined here in food together and we have written the whole of the new GCSE. So we've written all the lessons for Key Stage 4 and Key Stage 5 (Steph).*

This comment shows that job titles are significant to what teachers do and how they perceive their difference (Perry and Ball 2004, Gerretson, Bosnick and Schofield 2008). Planning responsibilities dictate a teachers' role and the function of their work (Britzman 1992). However, when talking to Mike about new teachers coming into the profession, Mike comments:

> *younger teaching staff that are coming through now seem to be far more - than my generation of teachers - happy with teaching a broader range of teaching [material] areas in terms of D&T. And happy to teach all those subjects [...] they seem to come in with a broader knowledge of those areas than we did let's say (Mike).*

This comment suggests that if teachers start their career with a broader range of experiences and expectations concerning teaching design and technology, Mike perceives them to have a generalist – single subject – approach (Design and Technology Association 2010, 2017).

5.2.2 Subject language

The theme *subject language* explores how teachers think about and describe subject curriculum - what is to be taught and learnt. Subject knowledge in design and technology involves designing, making, and evaluating. These elements can be grouped into *knowledge* (that is both content and process orientated), *concepts, skills and attitudes*.

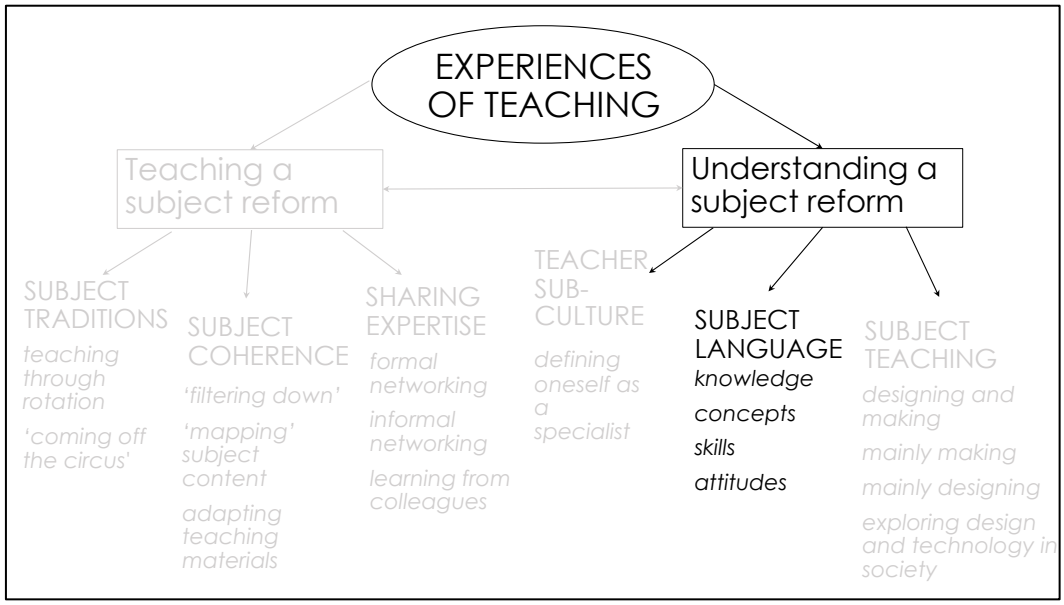


Figure 62: Map of sub-theme – Subject language.

5.2.2.i Knowledge

The sub-theme *knowledge* captures the different ways that teachers talk and think about subject content and process knowledge , see Figure 62. Participants frequently refer to design and technology content knowledge as 'theory', 'technical' and 'broad'; and process knowledge as 'skills'. In addition, participants think that content knowledge has been increased in the new curriculum compared to previous iterations. For example, when talking about the increase in theoretical content, Hetain comments:

> *There seems a lot more focus on kind of the scientific knowledge required for certain aspects of the design and technology concepts and materials. [...] the students need to develop their knowledge about the science behind fabrics and fabric construction methods (Hetain).*

This comment shows that Hetain believes knowledge of materials is

scientific, and this is different to ideas about the subject in the last version of the curriculum (Qualifications and Curriculum Authority 2007). By scientific, teachers mean the technological knowledge that is useful to solving design problems. When talking about how she has to teach more than in previous years, Vicky comments:

> *all the different materials areas and then we have got general things like sustainability, things like 'Crowd funding', renewable energy sources just the general kind of wider picture really (Vicky).*

Again this extract reinforces the view that the previous curriculum only focused on teaching process knowledge associated with making things and now teachers have to teach a breadth of curriculum beyond that (Archer, Baynes and Roberts 1992, Kimbell and Stables 2008, Stables 2008, Stables 2014, Morrison-Love 2016, 2017). Participants frequently describe process knowledge as 'skills' summed up in Alison's comment below, which describes the nature of GCSE knowledge:

> *they produce packaging NEA* [design and make activity] in year 9. So they're not doing GCSE, but they are picking-off those fundamental skills that they're going to require in GCSE (Alison).*

* Non-examined assessment

This extract illustrates that teachers think that 'fundamental skills' are an

important aspect of subject knowledge (Ashbee 2021). An aspect that needs to be embedded throughout KS3 (Department for Education 2010) as we can see from Mary's comment below:

> *their knowledge and understanding of design and technology seems to be a lot better embedded than year 9's when I started at the school (Mary).*

5.2.2.ii Concepts

The sub-theme *concepts* captures the different ways that teachers talk and think about the big ideas of design and technology. Participants generally lack the required language to communicate this part of the taught subject content, however, they frequently talk about subject concepts like designing and making. For example, when talking about teaching pupils to generate and develop design ideas, Deborah comments,

> *we are also trying to teach them some of the more advanced things like using Google SketchUp, 2-D Design, and how these link to things like the laser cutter, the 3-D printer (Deborah).*

This extract demonstrates that knowledge of Computer Aided Design (CAD) enables pupils to understand the relationship between design tools and equipment (Martin 2013, McCormick 1990). Design tools and equipment that are used to teach the big idea of technology. For example, when talking about mathematically using tools, Alison comments:

> *Our kids, even at year 8 can't find millimetres on a ruler. So, you have to kind of go and this is why we do it, this is why we need a millimetre, because if it's out of tolerance the whole things going to be out by like 3 mil. If you're out by one mil there... Then it's all going to add up at the end (Alison).*

This comment shows that teachers need to develop pupils' knowledge about 'tolerance', a technological principle that is related to the pupils tool and equipment use, alongside making things work (Spendlove 2011).

5.2.2.iii Skills

The sub-theme *skills* captures how teachers talk and think about the subject content related to performing tasks. Participants describe the increase in mathematical content knowledge as part of the new subject policy. For example, when talking about teaching skills, Hetain comments:

> *a lot more focus on developing students' mathematical skills and application of it within designing technology (Hetain).*

This extract implies that design and technology teachers also have to teach 'mathematical skills' and their 'application' as part of subject knowledge. Skills that help pupils with tasks like measuring (see link to the technology concept - 'tolerance') and the skills of questioning and reasoning associated with the design concept of generating ideas that meet clients and user's needs (Morrison-Love 2016, 2017). For example, when talking about teaching pupils to design, Judith comments:

> *teaching them that there's a problem to solve out there and being able to identify that problem. Doing some research, doing questionnaires (Judith).*

This illustrates the view that pupils need skills to perform the intellectual task of analysing a design problem (Martin and Riggs 1999).

5.2.2.iv Attitudes

The sub-theme *attitudes* captures how teachers talk and think about the values and personal qualities that the subject promotes. For example, when talking about the purpose of teaching technical knowledge and skills, Vicky comments:

> *things that are going to break around the house and rather than sending then to landfill they can possibly think about repairing them. [...] I do loads of things that we can do really around workshop that will teach them about maintenance and stuff putting up shelving and things like that (Vicky).*

This extract demonstrates that the subject ought to give pupils personal qualities and skills that make them resourceful and see the personal value in practical knowledge and skills (Crawford 2010).

5.2.3 Subject teaching

The theme *subject teaching* explores the different ways that teachers describe and think about how to teach a subject. Teaching design and technology involves designing, realising, critiquing, communicating and

knowing. These elements can be grouped into fundamental activities and key processes. These activities and processes can be further classified into the main subject pedagogies of designing and making, mainly making, mainly designing and, exploring design and technology in society.

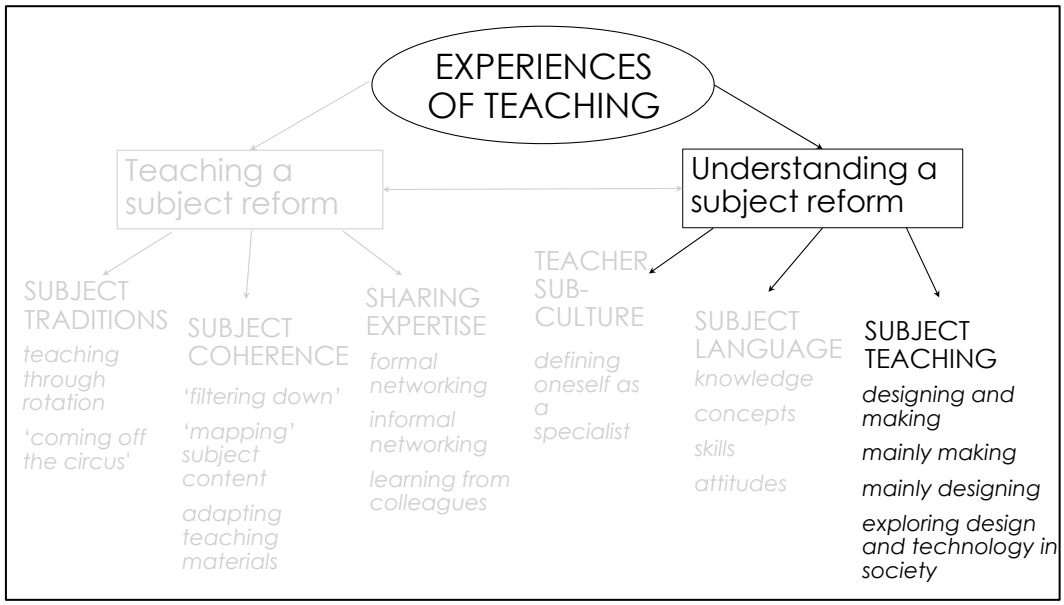


Figure 63: Map of sub-theme – Subject teaching.

5.2.3.i Designing and making

The sub-theme *designing and making* (Department for Education 1995) captures the different ways that teachers talk and think about teaching strategies that cover the content and process knowledge associated with design and technology capability (Kimbell and Stables 2008, Stables 2008, Stables 2014). Participants frequently refer to this type of activity as 'projects', 'coursework' and 'NEA'. Non-exam assessment (NEA) relates to the aspects of a qualification that cannot be measured through written papers (Ofqual 2021). Alison's comments about the social project she teaches, explains the nature of *designing and making* as a pedagogical strategy:

> *We do an architectural project to benefit XX City. So they have to do their research. They have to decide what kind of features in XX City will benefit. What kind of demographic it's going to benefit. [...] I talk about the materials and the design, [...] they all design different buildings in CAD. [...] it's not practical, [...] sometimes they'll model it (Alison).*

Alison's description breaks the teaching of *designing and making* activities into the elements of developing pupil's knowledge and skills related to research, materials, architectural products, and CAD. She judges this kind type of project as 'not practical' because the pupils do not always manufacture a product outcome (Martin and Riggs 1999). Although, Alison does explain that they sometimes 'model it'. Alison's comments appear to view this *designing and making* activity as risky because she delivers the session after pupils have 'chosen their options', see individual profile. When discussing holistic strategies for teaching design and technology subject knowledge participants frequently group *designing* and making into the defined material areas. When talking about how 'projects' are taught in design, Andy comments:

> *with the electronics and the resistant materials or product design - that we now call it - and graphics and decided to make that into one project. So, the graphics would be the design section of it, the electronics would be the electronic circuit inside and the resistant materials or product design would be the container that contains the electronics. To*

make sure that they had more time to create a more advanced outcome at the end (Andy).

This comment shows that the content and process knowledge required to teach design can be taught in one material area – graphics – and content and process knowledge required to make products can be taught in another – electronics and resistant materials. Andy's school operated a hybrid *'coming off the circus'* model that simultaneously moves towards crossing subject boundaries (Darby 2006, Mizzi 2021) whilst also demonstrating a CDT bias (Penfold 1988).

5.2.3.ii Mainly making

The sub-theme *mainly making* (Barlex 2012, Barlex and Steeg 2013, Barlex and Steeg 2017, Hardy and Norman 2021) captures the different ways that teachers talk and think about teaching strategies that cover the content and process knowledge associated with realising – the achievement of a desired outcome - through the activity of making. Making activities involve the use of equipment and tools to practise technical processes. Participants frequently refer to this type of activity as 'practical'. Mary's comments below sum up the significant nature of making activities within subject teaching.

Practical is them [pupils] making a product; practical is them being in a workshop or being on the sewing machine. And if they're not doing that, they're not making a monster or a photo frame or a clock. They don't see it as a practical lesson in the same way (Mary).

This extract demonstrates the view that practical teaching - *mainly making* involves the use of equipment and tools, in a workshop setting, to make an outcome in the form of something concrete (Morrison-Love 2016, 2017). However, the realisation of technical processes through the making of a concrete product is changing. For example, when talking about new ways of teaching, Kerry comments:

> *they don't do an out-and-out project as such. They don't you know in the old days of the steady-hand-game and so on, as part of the projects though, they have got material focuses where they do a lot of testing and the use of machinery (Kerry).*

This comment shows that making an 'out-and-out project' like a 'steady-hand-game' (or 'monster') is no longer required (Martin and Riggs 1999). Once the pupils have learnt to use equipment and tools to practise technical processes they realise their ideas and products in a model form. For example, when describing the need to have pupils realise different solutions to a problem, Mike comments:

> *I think one of the biggest changes that we've got to do is to actually just do modelling a bit more. Do far more. Just working with Styrofoam. Far more just working with card, board, doing things like toiles and stuff like that (Mike).*

The idea that cheap materials like Styrofoam, card and calico can be used to achieve the desired outcome for pupils illustrates the shift in

understanding about what can be viewed as acceptable practice (Nicholl, et al. 2013, Turnbull 2002).

5.2.3.iii Mainly designing

The sub-theme *mainly designing* (Barlex 2012, Barlex and Steeg 2013, Barlex and Steeg 2017, Hardy and Norman 2021) captures the different ways that teachers talk and think about teaching strategies that cover the content and process knowledge associated with ideation – the formation of ideas and concepts through the activity of designing. Less frequently participants talk about teaching pupils to design without making. For example, when talking about teaching in a style that reflects GCSE expectations, Steph comments:

> *Not even necessarily handing in the finished projects. It could be design ideas, it could be a prototype model, it could, you know, not so obsessively 'We've got to make this and take this home'. Like I make a wooden box in that, I make a pair of pyjamas in that (Steph).*

5.2.3.iv Exploring design and technology in society

The sub-theme *exploring design and technology in society* (Barlex 2012, Barlex and Steeg 2013, Barlex and Steeg 2017, Hardy and Norman 2021) captures the different ways that teachers talk and think about teaching strategies that cover the content and process knowledge associated with critiquing – reviewing, appraising and evaluating a design idea or product. Critiquing activities involve the consideration of design choices and how these impact the material and natural world around us. Only two

participants describe the practice of *exploring* design and technology in society. For example, when talking about the types of strategies that are used to teach the writing of a design specification, Deborah comments:

> *we still use ACCESS FM*, in order to help them structure something like a specification, we do some product analysis first (Deborah).*

* the mnemonic ACCESS FM stands for Aesthetics, Consumer, Cost, Environment, Size, Safety, Function and Materials. It is a strategy for thinking through user needs and wants when designing a product.

This comment shows that the analysis of an existing product can help pupils learn about what goes into a specification and therefore identify criteria for their designing (Lee and Todd 2004). The same strategies can be used to teach the new as in previous curriculum.

5.3 Additional themes

5.3.1 Feelings about change

When talking about feelings about the subject change, Kerry comments:

> *I think they have been great. I think they have been really beneficial, it's been worth the extra work in getting to that model (Kerry).*

This illustrates the view that Kerry perceives 'extra work' to be part of his job and an essential activity if the change is welcome.

When talking about feelings about the subject change, Judith comments:

> *because we didn't get a textiles group this year. [...]. It just makes me feel sad really. You have to react don't you. If you're not getting the numbers. I treat it a bit like a business. If you don't react to it, the business is going to go under (Judith).*

To summaries, she is saying that you 'have to react' to 'dwindling' GCSE groups by finding new ways of working.

When talking about feelings about the subject change, Hetain comments:

> *I think right now I'm feeling really restricted. And, again, that's different for individual schools, depending on the dynamics of your team and the department that you're working in. And, if, if you've got somebody who's very controlled within the department, in terms of how teachers are working… as a result of fear, I guess, as a result of pressures to achieve results within the department (Hetain).*

This extract demonstrates that 'controlled' methods of teacher management brought about by 'pressures' linked to 'results' leading to 'feeling restricted' about new ways of working.

5.3.1.i Developments Required

When talking about the practice of curriculum review, Steph comments:

if you've done something that's not brilliant you think: You don't enjoy it do you? When you come out with it, I don't think the kids really got much out of that. [...] Constantly trying to evaluate what you do and think 'Was that a good lesson?' 'Could I have done it better?' 'How could I change it to make it better?' And you are kind of constantly trying to improve what you do (Steph).

Alison also comments:

So my year 9, I have… I have played around with it a bit in the last couple years. I unpick skills within the GCSE spec to kind of begin to teach. [...] I haven't got sort of a year nine scheme of work which I could really talk you through. Because I changed it this year to manipulate my findings from the year before, so to speak (Alison).

Both of these comments emphasise the view that curriculum development is ongoing. Alison is willing to develop the departments curriculum by adjusting plans on an annual basis. She does not see the lack of a written curriculum - 'scheme of work' – as a problem, which might be a consequence of her solo working (see Figure 21, section 4.2).

When talking about support for curriculum review, Mike comments:

I think the Design and Technology Association could do a lot more to generate ideas for different things we could

> *practically do within our lessons to, you know, move the students forward, to help them progress, to help them to understand those concepts, around all our schools (Mike).*

Mike thinks the subject association (DTassoc.) ought to provide practical solutions to teaching the new subject policy. He believes this would help all schools (not just his own) to support pupil progress.

5.4 Categories of description

This section reports a limited set of concepts that describe these teachers' actions in response to policy development. First, themes identified in the thematic analysis (see Section 5.1 – 5.3) were interpreted. Then categories of descriptions (see Figure 64) were generated, in line with the phenomenographical method typical of Marton (1981), Bowden and Walsh (2000), and Patrick (2000).

The thematic analysis highlighted a set of six themes within the data:

- subject traditions;
- subject coherence;
- sharing expertise;
- teacher sub-culture;
- subject language;
- subject teaching;

I sorted these into categories that represented persistent subject traditions – *OLD* - or newly generated subject traditions – *NEW* - (Giddens 1994).

This action allowed me to place the descriptions into either/or categories in about teaching, understanding and working:

- either teaching in or outside a traditional specialism (*Teaching through rotations* or *'coming off circus'*) to develop the *knowledge*, *concepts, skills* and *attitudes* of the knowing era;
- developing an individual or shared aesthetic understanding (by *'filtering down', Mapping subject content*, or *Adapting teaching materials*) to inform the pedagogy of *designing and making, mainly making, mainly designing*, and *exploring design and technology in society*;
- working in isolation or sharing expertise (through opportunities linked to *Formal networking*, *Informal networking* and *Learning from colleagues*).

The categories capture the design and technology teachers' issues and challenges. Issues and challenges associated with the subject tradition of teaching in and outside a subject specialism (Childs and Nicholl, 2007, Gerretso, Bsmick and Scholfield 2008, Millar 1988 and Mizzi 2021). The developing coherence of an emerging aesthetic understanding (Darby 2006) and pedagogical approaches to building design capability (Kimbell and Stables 2008, Stables 2008, Stables 2014). These either/or dimensions reflect the complexity of shifts in practice from teaching across material area specialisms towards teaching design and technology as a single-subject. In addition, the dimensions describe a move to collaborative professional development as an approach to dealing with

policy reforms (Ball 2017) and the types of complexity for these teachers that change brings.

I have been mindful that the phenomenographical method is an interpretative process. To ensure researcher integrity, I followed Ashworth and Lucas's advice (see Chapter 3) to cross-reference the themes identified in the thematic analysis with the individual profiles (see Chapter 4). I did this to empathise with the teachers and support my interpretation of how they described their actions and feelings about policy development. In doing this, I recognised that unlike other phenomenographical studies that lead to a hierarchical set of categories, my study would not be hierarchical. Instead, I interpreted the data into a set of non-hierarchical dimensions that describe different categories of design and technology practice. I did this because these teachers often told a hybrid set of dimensions in that their responses straddled both the *OLD* and *NEW* categories. For example, Mary had the dimension of *inside* alongside a *shared understanding*, *with others*, when she planned and taught the specialist textile lessons (*inside*) for colleagues (*with others*) that could be delivered across the curriculum at key stage 3 (*shared understanding*). What is worth emphasising here is that even when teachers work *in isolation*, they hold onto their sub-culture whilst moving outside their subject specialism. This holding on, reflects Darby's (2006) progressive stages for crossing the boundaries of subject sub-cultures (Goodson 1998).

Figure 64: A description of the limited dimensions to design and technology teachers' approaches to practice in the subject.

This interpretation did not find a limited set of ‘OLD’ or ‘NEW’ categories within the *subject teaching* (see Section 5.2.3) and *subject language* (see Section 5.2.2) themes from the thematic analysis (see Section 5.1 to 5.3). However, these dimensions spanned both *OLD* and *NEW* categories, therefore, I have added these dimensions to the sides of Figure 64.

Chapter 6 Discussion

Chapter 6 uses the lens of agency (Emirbayer and Mische 1998) to analyse the individual design and technology teacher profiles and themes across the data provided in the previous two chapters (see Chapter 4 and 5). This chapter divides into three sections. The first section discusses the different ways that the data shows how teachers drew on their past (iterational) experiences of teaching the subject to influence their responses to policy development in the present. The second section examines how the data demonstrates these teachers' future (projective) ideas about teaching the subject to influence risk-taking in the present. The third section discusses how these teachers made judgements about actions to be taken in the present (practical-evaluative) to deal with the issues and challenges the new subject development posed (Department for Education 2013, 2015b). This chapter informs my developing practice-relevant theoretical and research knowledge about answers to both my research questions:

- what are the specific issues and challenges that design and technology teachers face when translating policy development into practice?
- what professional experiences influence different teacher responses to the challenges a policy development brings to established practice, focusing on teacher agency?

6.1 The iterational dimension of teacher agency

This section interprets these teachers' accounts of the habits, routines

and professional histories that influence their responses to the challenges a policy development brings to established practice in the present, (see Figure 7 in Chapter 2). The section divides into three sub-sections that discuss the influence of habits and routines (Emirbayer and Mische 1998), professional histories (Priestley, Biesta and Robinson 2015), and design and technology teacher values (Emirbayer and Mische 1998). This section highlights the role of professional knowledge (pre and post-training) in supporting teachers' capacity to generate new traditions from old.

6.1.1 Past habits and routines

The results of this study indicate that the routine of delivering design and technology lessons through a rotation of separate material specialisms is still a day-to-day experience for teachers working in the subject (see Sub-section 5.1.1.i). A habit that perpetuates the historic CDT circus (Penfold 1988) criticised by Ofsted (2008, 2011) and observed by Paechter (1995) as an influence on subject sub-culture divisions. For example, the past habit of splitting KS3 curriculum into short (for example, eight week long) projects that 'carousel' through different material specialisms led teachers to view the subject as a set of separated forms of knowledge that can only be understood through design and make projects that focus on one material specialism. This view of the subject is seen to be reinforced through the idea that individual teachers should be allocated to plan and teach those projects in isolation, which in turn segregates teachers and forms barriers to the reform - see Mary (Sub-section 5.1.1.i) and Deborah (Section 4.5). Combined, the factors of teaching through a rotation model

and segregating teachers to one material specialism activates present and future subject sub-culture divisions.

The results reported here support the idea that although these teachers of design and technology have qualified through a dual-disciplinary ITE course (Design and Technology Association 2010) and share applied subject-specific first-degree histories (Bell 2015), the tradition of teaching the subject through a rotation of teachers and material topics continues to reproduce the idea of separate subject sub-cultures. Therefore, this research project confirms that these teachers still practice a form of sub-cultural retreat, which Paechter (1995) identified at the start of the subject's transition from craft-based aims to those of the National Curriculum. The habit of allocating individual projects or units of learning to individual teachers within the teaching team creates a barrier to the kinds of activities that promote interdisciplinarity and keep teaching focused on mainly making activities that masquerade as design and make activities (Ofsted 2008, 2011, McGimpsey 2011). Interdisciplinarity can only be developed through 'a shared pedagogical approach' and a more established set of 'disciplinary characteristics' for the subject (Bell, et al. 2017p, 547). For example, Deborah says that she wants to bring teaching staff and curriculum together; however, the culture of subject rotations and a lack of spaces to talk as a team prevent Deborah from applying actions that deliver this intention. Instead, her experience of colleagues not sharing knowledge and resources leads her to make individual teachers responsible for segments of the curriculum. This finding is important because it shows how the connection between habits of continually

separating the subject into material rotations and a lack of space for shared working, stops the teachers from engaging in any kind of collective experiences (be they professional or social). The consequence of these two factors limits the teachers' ability to achieve the agency desired to reform the subject sub-culture divisions (Penfold 1988, Paechter 1995), see Figure 65.

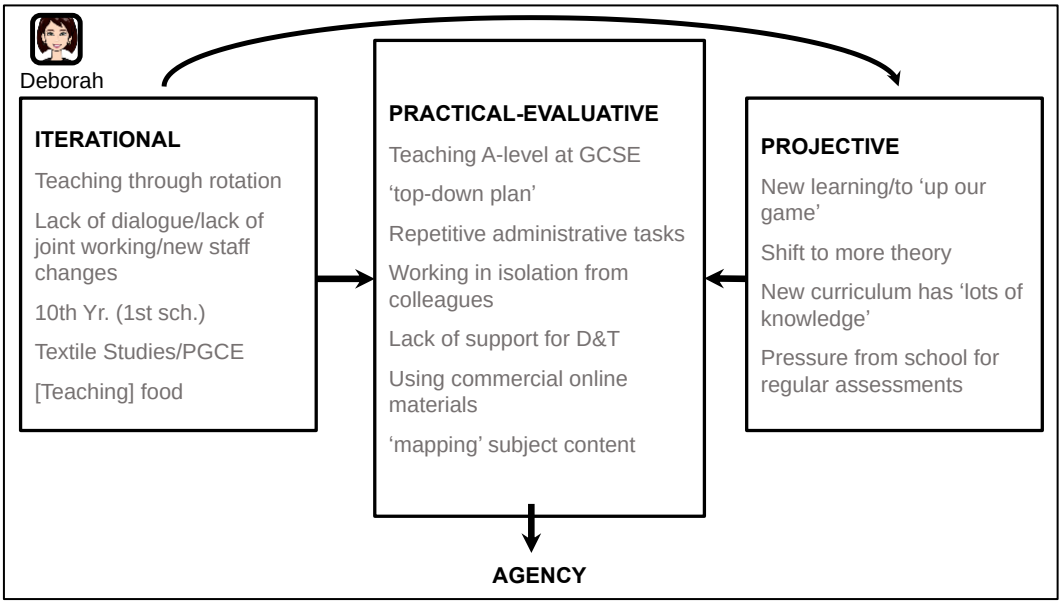


Figure 65: A model of Deborah's achievement of agency.

The policy is about ensuring pupils at KS3 experience a range of contexts and at KS4 that they develop core knowledge and skills across a variety of material areas and electronics. Curriculum developers (Barlex 2012, Barlex and Steeg 2013, Barlex and Steeg 2017, Hardy and Norman 2021) and scholars (Bell, et al. 2017) assert that teachers need to work together to help pupils develop core knowledge and skills across various material areas, and electronics, through experiences that cover all material areas. The intention is that if pupils are taught design and technology as a single subject at KS3, then they will be better prepared for learning about core

knowledge and skills at KS4, and they will equally value the breadth of design and technology. However, the consequence of habits that clash with teachers' values could result in individual disengagement and moves away from the subject (like choosing to teach an art and design course) as a response to change (Giddens 1994).

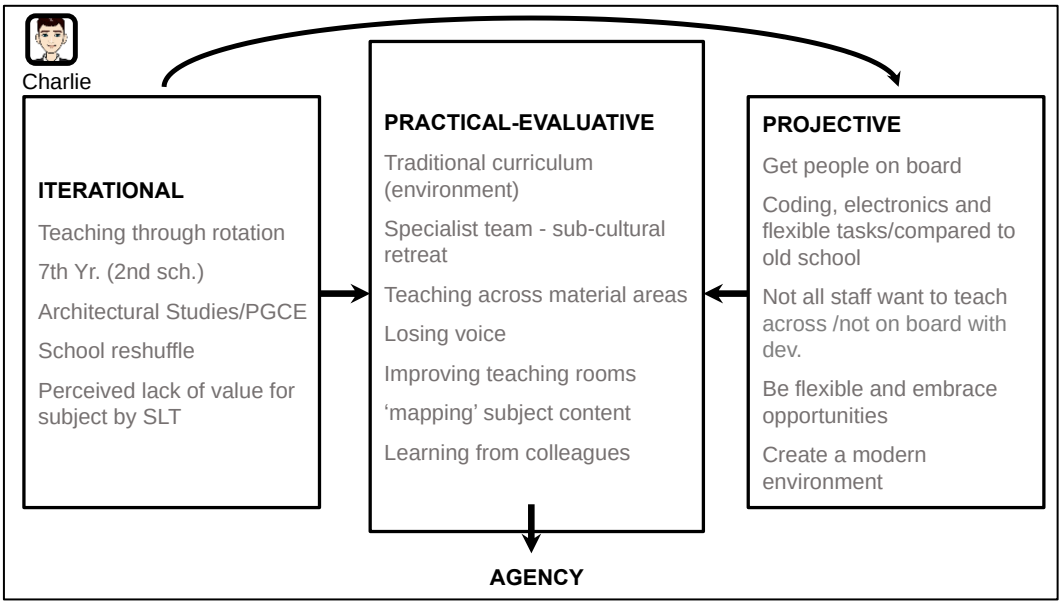


Figure 66: A model of Charlie's achievement of agency.

The reason for this is not really obvious, but the research project suggests that the teachers' contexts and who they work with may also inform decisions in the present. For example, Charlie imagines teaching a modern curriculum (that he describes as flexible) similar to his previous school (iterational dimension), but he does not have the agency to change this due to a loss of generalist power (iterational dimension), see Figure 66. This past experience informs his judgment that he needs to get teachers 'on board' with his ideas (practical-evaluative) but his loss of generalist influence drives him to actions that focus on his individual classroom teaching. Charlie's individual achievement of teacher agency is

important because it shows how past experiences of integrated design and technology can influence teachers' work even when they move to a non-integrated department. However, the lack of integration in his current setting creates barriers to progress that might threaten his capacity to apply an integrated approach in the future, not unlike the way that learning during an ITE courses does not always continue (or even happen) post-training (McLain, et al. 2014). This is important because it means that if past experiences are individual they have less impact than collective past experiences, which have the potential to result in shared habits (Darby 2006). Charlie's individual endeavour to teach across different aspects of the subject does not directly benefit others in the department and therefore pupils in the school.

Questions therefore, remain about the proportion of individuals that can affect collective change within a department. How many and what types of professional histories make up the best environment for developing curriculum and applying change?

6.1.2 Professional histories

The results of this research show that teachers' past experiences of teaching outside their material specialism, across KS3, informs collective professional development practices that have the intention of transforming team expertise in line with the subject change (to integrate the subject and develop design and technology capability in learners across the material range). Furthermore, the interplay of past habits of teaching both in and outside a specialism inform these teachers' ideas about future

expectations and teacher expertise (Priestley, Biesta and Robinson 2015), see Judith, Figure 67 and (Section 4.7). A generalist teacher role that includes the teaching of a broad range of knowledge can lead to the possibility of joint development of design and technology subject expertise and skills. In fact, this type of shared team expertise has potential to develop a joint aesthetic understanding (Darby 2006).

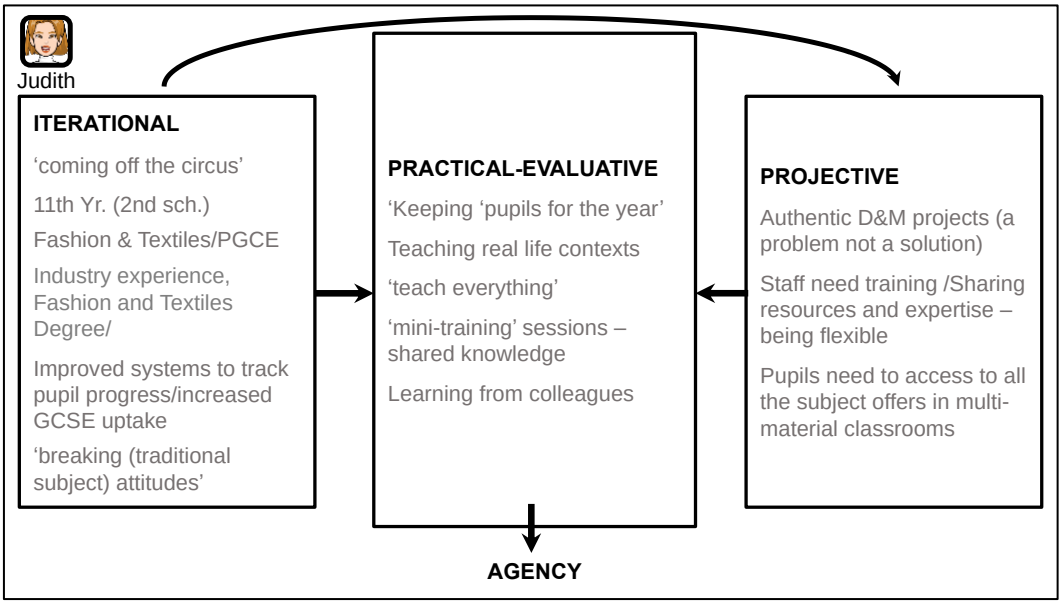


Figure 67: A model of Judith's achievement of agency.

These results further support the idea of a teacher's role changing over time in relation to the context they work within (Eteläpelto, Vähäsantanen and Hökkä 2015, Karousiou et al. 2019). The school or department context offers to change working conditions and practices that inform the role a teacher adopts (Douglas 2011, 2014). This finding is significant because what a teacher does influences a teacher's capacity to innovate change and agency (Buchanan 2015). Furthermore, access to opportunities that offer teachers experiences of teaching outside their specialism can extend the teacher's role and reinforce the formation of

integrated knowledge (Bell et al. 2017) and greater aesthetic understanding (Darby 2006) within design and technology.

It seems possible that these results are due to the context that teachers worked within and the fact that my sample of teachers had all come through a multi-disciplinary ITE course (at the same ITE university-base provider). They indicate a shift from solely teaching their first-degree (Bell 2015) to teaching more broadly. This may be due to changes in subject policy, but it also seems possible that these results are due to a reduction in GCSE teaching brought about by the decline in GCSE entries for design and technology (Hepworth 2019) and lack of specialist design and technology teachers within the system (Worth 2021). Both these contexts potentially contribute towards the drive for teachers to teach both in and outside a specialism (Thornton 1995, Darby 2006, Childs & McNicholl 2007, Morgan & Bourke 2008, Chapman, Wright & Pascoe 2020, Sani & Burghes 2022). The need to be flexible and teach in and outside a specialism has the potential to embed new traditions (Giddens 1994), in this case, related to interdisciplinary teaching (Bell et al. 2017) that support design capability (Kimbell and Stables 2008, Stables 2008, Stables 2014). The study, therefore suggests that opportunities in school departments to teach both in and outside a specialism are an important mechanism in promoting subject sub-culture alignment (and thus avoiding disparate teaching values within the same subject department).

6.1.3 Design and technology teacher values

This study found that these teachers' past experiences of networking

opportunities across Academy Trusts informed their dispositions towards sharing expertise (see Section 5.1.3). The interplay of past routines around networking split into three types. First, the teachers' action of getting together with other schools (formally) to compare practice and discuss teaching and learning, see, Kerry, Hetain and Alison (Sub-section 5.1.3.i). Second, these teachers' habit of identifying as part of a bigger collective (beyond a school). Finally, the teachers' habit of welcoming other teachers' ideas and expertise, see Charlie, Judith, Steph and Kerry (Sub-section 5.1.3.iii) informs the teachers' orientation towards future expectations about professional learning and actions that open the teachers up to potential practice transformation (Darby 2006).

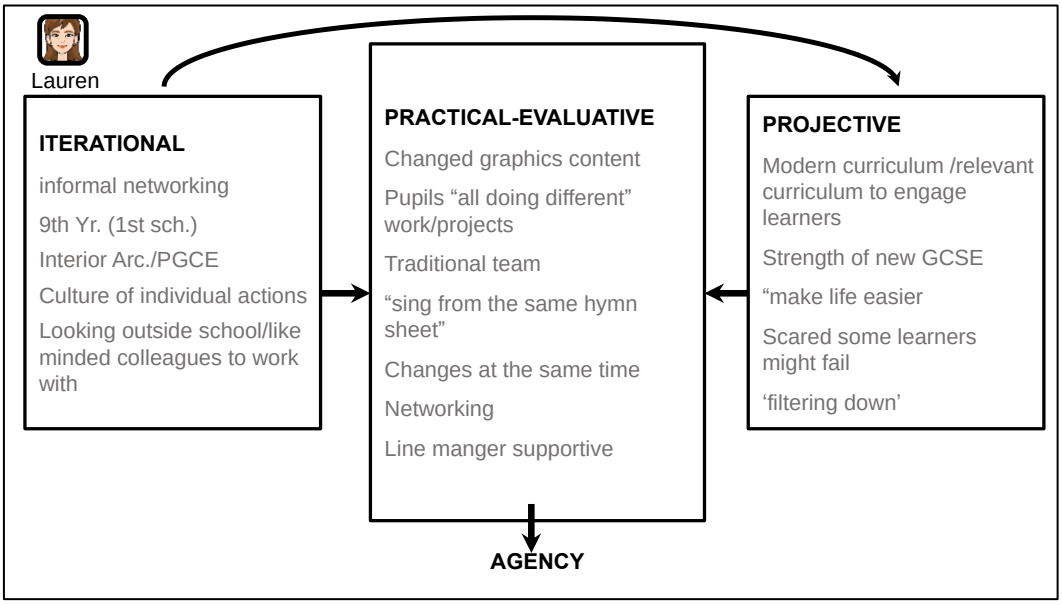


Figure 68: A model of Lauren's achievement of agency.

These results further support the idea of design and technology teachers using collaboration as a mechanism for extending the subject material specialism boundaries and developing an aesthetic understanding (Darby 2006) through dialogue (Giddens 1994). This is significant because it

appears that the teachers capacity to join networks and establish opportunities for dialogue strengthens the agency of these teachers during a subject change, see Figure 68 and Lauren (Section 4.7).

There are several possible explanations for this result, including the move to in-house staff training and professional development favouring across Academy Trust working (Department for Education 2010). The rise of in-house – across Academy Trust – professional development as a mechanism to save money and generate greater coherence has led to a shift to inhouse professional development. This self-sufficient approach has been adopted by teachers at a local scale, for example, in the case of Lauren, see Figure 68. A sense of collectiveness has possibly been reduced through the reduction in subject status and GCSE uptake. Therefore, opportunities to network beyond one's own school or context engender positive dispositions towards risk. Having opportunity to network beyond own school or context is significant because the dialogue about how subject teaching is practised in one location can be compared to another. The opportunities afforded by this dialogue can develop personal and collective evaluation about the different ways of doing design and technology. The membership of a community encourages risk-taking (Hordern 2015) through interdisciplinary or cross-school language. Past opportunities for dialogue with colleagues (Giddens 1994) allow for an aesthetic understanding of the subject (Darby 2006).

There are still many unanswered questions about what is lost through the shift to the Academy Trust and in-house professional development. What

happens if a teacher works for a small Academy Trust or does not have a mechanism for joining forces with other colleagues outside their school. I did not get the opportunity to talk to Judith about her experience of collaborating outside the school or compare the different types of teacher communities (Hordern 2015). Other questions that remain include the benefits and weaknesses of collaboration within the teachers' Academy Trust where knowledge may be limited and practice specific to one school context.

6.2 The projective dimension of teacher agency

This section interprets these teachers' accounts of their imagined future scenarios and plans for intended actions based on identified risks in the present, see Figure 7 (Chapter 2). The section divides into three sub-sections that discuss their imagined scenarios (Emirbayer and Mische 1998), plans for action (Giddens 1984, Priestley, Biesta and Robinson 2015) and intentional actions (Scott 2007). This section suggests that these teachers' future (projective) ideas about the subject and what could be, focus on what they feel is best for themselves and the pupils they teach. The desire to be respected, heard and teach lessons that develop relevant knowledge and skills.

6.2.1 Imagined scenarios

One of the findings from this study shows that a teacher's desire to develop stronger teacher-pupil relations that support pupil progress influences their willingness to test and trial new scenarios for KS3 delivery

and organisation. The teachers' stories of past positive experiences of pupil progress, see Mary (Section 4.10) and enthusiasm towards the subject, see Judith (Section 4.7) inform future teaching plans. Imagining scenarios based on past experiences allowed the teachers to identify the risks associated with child-centred (Ellis 2014) approaches (rather than ones designed to meet the needs of design and technology teacher difference).

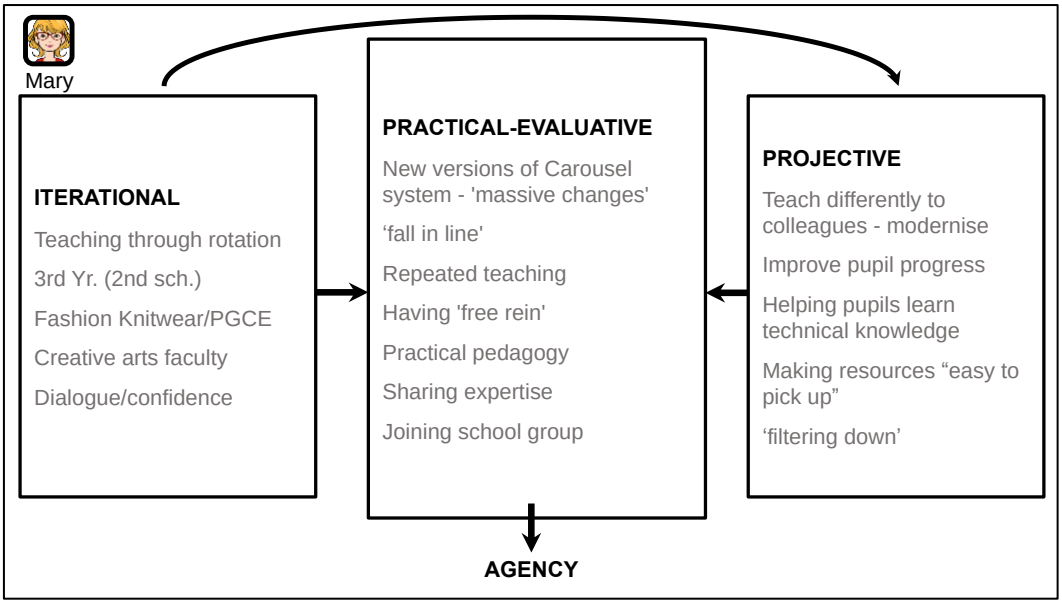


Figure 69: A model of Mary's achievement of agency.

These results confirm Fullan's (2015) claims that change is a process. A course of action that through testing and trialling leads to different ways of doing the subject. Even when decisions might be made for pragmatic reasons. For example, when Mary is driven to teach pupils for a longer period of time, due to decisions made by a more experienced and influential colleague (head of department), she is able to witness the benefits of such a practice, see Figure 69 and Sub-section 5.1.1..ii. Even though the shift to staying with one group for longer is a decisions made

by others, the experience modifies Mary's attitude towards the idea. This adds new insight with regard to Paechter's suggestion (1995) that leadership reinforce traditional ways of working through a lack of challenge. This finding suggest that leadership is challenging traditions within the subject. This is because, the move away from the CDT circus leads to new traditions that better support pupil progress (Ofsted 2008, Ofsted 2011). The short term goal to teach the children all year round ensures better progress achieves long term goals about developing design and technological capability that needs time to develop (Kimbell and Stables 2008, 2008, 2014).

There are several possible explanations for this result. Why teachers are prepared to take risks with the traditional way that curriculum is organised in design and technology might come from the 'filtering down' of GCSE expectations or a push from others (leadership). The desire to improve GCSE results has not traditionally been associated with spending more time with pupils. However, once the rotation tradition is broken it appears that teachers formulate new desires about pupil experiences linking extended time in the subject with improved learner knowledge and skills. Why is this? It is my deduction that a shift to a focus on general pupil aims rather than specialist subject specific aims could be attributed to an increase in the number of female teachers working in design and technology, compared to the time when Paechter (1995, 1996) completed her research.

6.2.2 Plans for action

Opportunities to teach and trial new ways of teaching design and technology are not something to be taken for granted. This study shows that a desire to avoid the increased workload that comes with teaching outside a specialism informs some of these teachers' reluctance to test and trial new teaching materials. The teachers' stories of negative planning experiences include, a lack of trust in equal support from colleagues, see Steph (Section 4.12) and short notice of a change in planning, see Hetain, (Section 4.6). These experiences inform teachers about the potential risks of change. Risks of change that possibly lead teachers to avoid different and new scenarios. Imagining scenarios based on these past experiences drives the teachers to focus on identified risks associated with researching and developing new teaching.

These findings are consistent with Hargreaves (2005) argument that a teacher's age and career stage brings different capabilities towards the promotion of, or resistance to change. Capabilities that support mentoring across the generations and memory from wisdom and learning. These teachers relate to Hargreaves demographics in the following ways. First, late-career teachers potentially have the wisdom of what may or may not work, but not the desire, see Steph, (Section 4.12). Second, mid-career teachers will use their experience and position in the school to weigh-up associated risks, see Andy (Section 4.3), Kerry (Section 4.8), Lauren, (Section 4.9), and Alison (Section 4.2). Finally, early career teachers are likely to be the most enthusiastic without the necessary authority, see Vicky (Section 4.13) and Mary (Section 4.10). This is significant for the subject because a reluctance to change may lead to clashes across a

team of teachers (Giddens 1994). For example, Steph's background in industry (see Figure 51) gives her the desire to modernise and develop new traditions around 'coming of the circus', however, the mentoring she receives from the head of department is focused on isolating colleagues into material specialisms that she feels align with CDT bias (Penfold 1988).

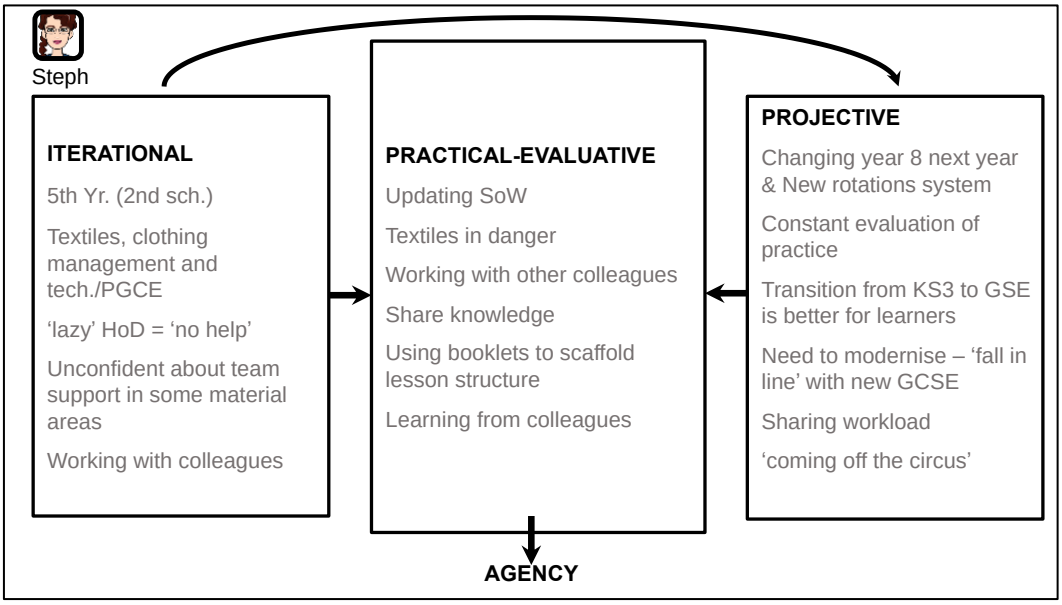


Figure 70: A model of Steph's achievement of agency.

There are possible suggestions for why these teachers career stages influence changes in practice. Knowledge of the risks associated with a team that has different goals and capacity to share workload can drive teachers to translate policy as only relevant to parts of the subject. Meaning that practices ought to change for some aspects of the subject but not all. Steph can see that bringing the different parts of the design and technology curriculum together is a good thing and will benefit her learners in the future. However, she works in a department that practices teaching through material specialisms with the expectation that individual

teachers plan and teach for themselves and not others.

There are still many unanswered questions about how teachers feel about teaching in different specialisms. For example, Charlie's attitude is different to Steph's, (see Section 5.1.1). Charlie has confidence in teaching food despite having no formal training or expertise. In comparison, Steph feels unable to teach the wood, plastic and metal aspects of design and technology without support from an expert about equipment and teaching materials. I did not ask Steph why she thought going in and teaching RM – wood, metal and plastic - would be hard and time-consuming. However, it is interesting to reflect on the way Steph's view of the risks associated with teaching outside a specialism contrast to that of Charlie. I have contemplated how both Charlie and Steph's confidence about teaching outside their specialism might be influenced by others. In Charlie's case, the attitudes expressed by members of senior leadership, in relation to thinking that 'anyone could teach the subject' (see Section 4.4). In addition, Steph 's perception that her head of department, did not value aspects of the subject beyond those of RM – wood, metal and plastic.

6.2.3 Intentional actions

The current study found that teachers' desire to develop pupils' knowledge and skills to pass the new examination informs the teachers' decisions to trial new KS3 curriculum content and teaching methods. These teachers' stories describe project scaffolding (Bruner 1966), linked to restrictions on design, see Andy (Section 4.3) and embedding

examination skills, see Lauren (Section 4.9). Finally, the teachers' experienced pupil dislike of the idea that the GCSE requires an understanding of technical knowledge associated with a range of material areas, see Hetain, (Figure 71), Judith, (Section 4.7) and Steph (Section 5.1.2.i). These experiences then inform these teachers' actions to test and trial new versions of technical content and introduce new pedagogical approaches earlier in the curriculum. Imagining scenarios based on these negative past experiences drive the teachers to plan for a positive future by transforming present curriculum and pedagogy into an integrated and academic approach that deviates from the established norm.

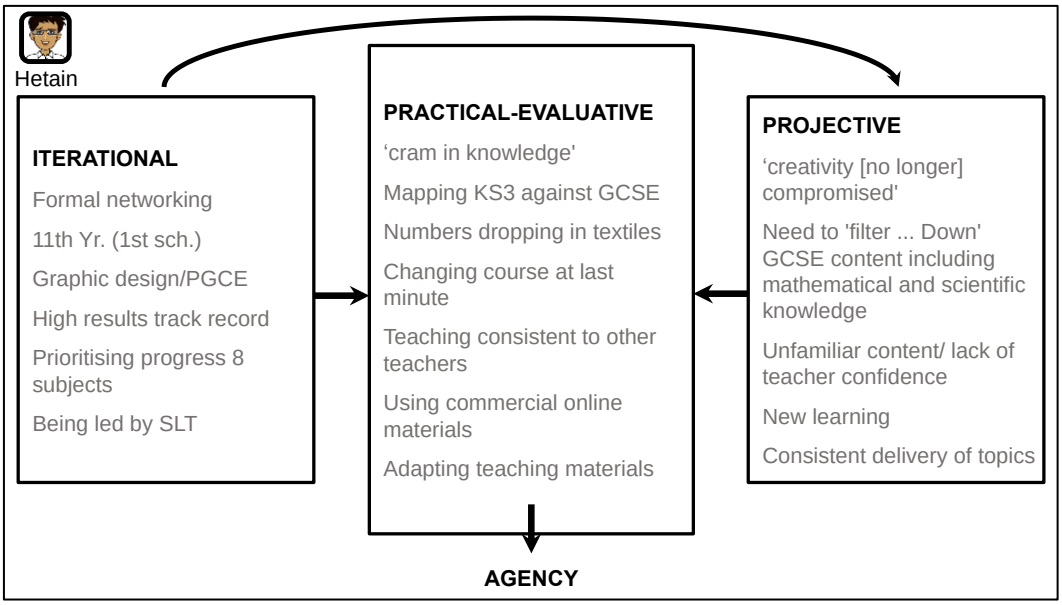


Figure 71: A model of Hetain's achievement of agency.

These results support the idea that teachers are driven by a need to demonstrate that their pupils can perform well in examinations by developing skills associated with using knowledge. If we look at the idea of performativity first. The teachers want to achieve improved outcomes for their pupils by intentionally planning to teach new lesson content. This

supports discussions around performativity and Doyle et al. (2019) who found that teachers were concerned to continue good examination results by ensuring that practices that worked were repeated. This study shows the same concern about passing examinations and a willingness in teachers to integrate the teaching of material specialisms. However, compared to Doyle's research this study shows that teachers are willing to adapt teaching materials and methods in the hope that it will bring about the same outcome. Secondly, if we look at Winch's (2013) criticism of teaching problem solving without teaching pupils how to apply the skill required to bring lots of disparate information together then we can see that this study shows how these teachers come to the same conclusion through their experiences of working with young people in the classroom. These teachers' evaluation of why the pupils are struggling in the examination is made concrete by the identifications of a need to improve examination language before pupils develop knowledge by acquaintance.

It seems possible that these results are due to an emphasis in schools on demonstrating success through pupil grades regardless of school resources and pupil backgrounds. The pressures to perform and achieve grades that reflect well within locally published league tables motivate teachers to do well for their pupils. As a result, teaching exam language becomes a focus instead of teaching pupils how to interpret texts and develop skills in recalling information and making connections. However, this data must be interpreted with caution as I did not have the opportunity to explore Lauren's reasons for prioritising pupils' examination language over their design and technology capacity.

There are still many unanswered questions about why the teachers prioritise doing well in examinations over developing robust design and technological capability in their learners. One explanation could be that teachers prioritise doing well in exams because they are judged on their pupil grades. They want their pupils to do well, and for pupils to do well, they need to get better grades. However, the focus on getting better grades only promotes the extrinsic value of leaning a subject like design and technology. For teachers to develop an intrinsic desire to learn about the material world in their pupils, they need to make connections between the examination criteria and these aims. For example, Alison talked about wanting the pupils to go home after the first lesson ‘excited about the subject’ by using the tools and equipment. One interpretation of this desire would be that Alison wants pupils to have a positive experience that builds an intrinsic joy for the subject that will lead to pupil success.

6.3 The practical-evaluative dimension of teacher agency

This section interprets these teachers’ accounts of the identified problems that the subject development creates and which they in turn use to make judgments about the course of action to take in the present, see Figure 7 (Chapter 2). It is divided into three sub-sections that discuss the identified issues and challenges that these teachers faced (Giddens 1984), the judgements they made about actions to take (Emirbayer and Mische 1998), and the new habits and routines they achieved (Emirbayer and Mische 1998, Scott 2007). This section suggests that the teachers draw on their individual iterational and projective agency, within the context of

the structures they work within to make judgments about what the subject is (means for them), what they teach, how they teach it, and how they learn about it. These judgments combine to shape the teachers' intended actions towards shifts in practice that evolve the subject (irrespective of policy reform). Developments in practice that have the potential to impact school improvement and support legitimisation of the subject.

6.3.1 Problematising the translation of policy into practice

The current study found that some of these teachers resolved the issue of losing pupils to other areas of the curriculum, and shifting approaches to 'coming off the circus' by adopting actions that promoted engineering aims. Engineering aims that relate the subject to the world of work (Layton 1994) and industry (Martin 2013) through recognised vocational pathways (Department for Education 2015a) and teaching environments (Priestley, Biesta and Robinson 2015). For example, Mike, (see Section 4.11) and Judith (see Section 4.7) both describe the intention to set up engineering classrooms and adopt engineering qualifications. In addition, both Andy and Charlie (see Section 4.3 and 4.4) describe their current experience of delivering an engineering GCSE. Andy justifies this shift as an alternative for the kinds of pupils that historically opted for previous qualifications in electronics (which he typified as pupils with high attainment goals), see Figure 72.

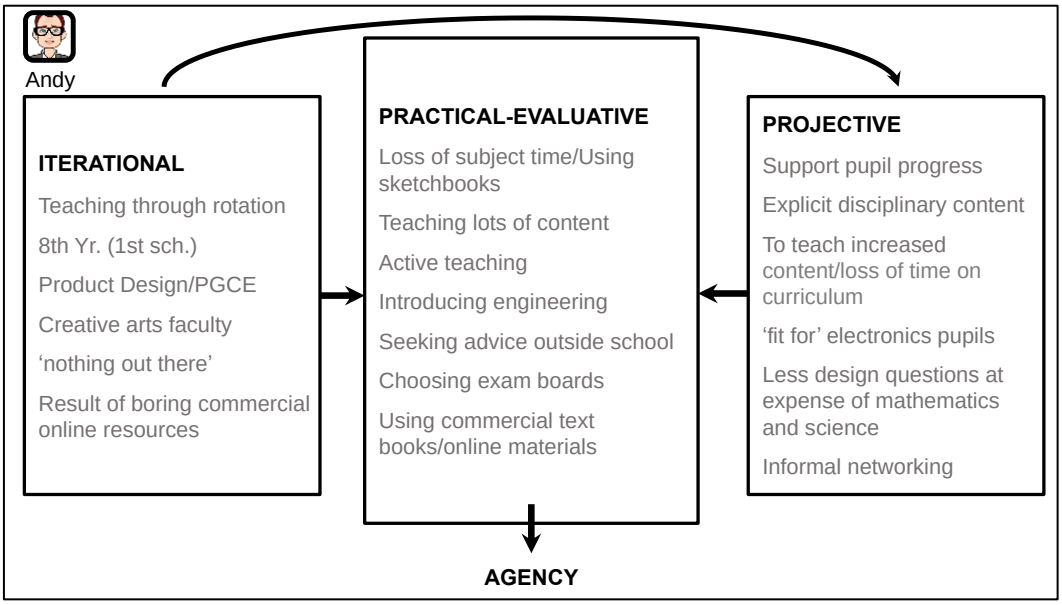


Figure 72: A model of Andy's achievement of agency.

These findings reveal how the teachers are moving towards an interdisciplinary view of the subject (Archer, Baynes and Roberts 1992) that promotes a shared aesthetic understanding (Darby 2006). A subject that simultaneously links to business and industry (McCormick 1990, Martin 2013), whilst moving towards authentic practices (Turnbull 2002) that build design capability (Kimbell and Stables 2008, Stables 2008, Stables 2014). Fields of knowledge (Winch 2013) that combine to explain Ashbee's (2021) description of the forms of knowledge captured in the policy reform (Department for Education 2013, 2015b). This finding suggest that these design and technology teachers perceive that the development of powerful knowledge (Young and Muller 2013) aligns with versions of the subject called engineering.

Hetain translates the policy development as a shift to what he calls 'the science behind fabrics' (see Section 5.2.2.i), which he perceives to be a distinct change from previous iterations of the curriculum (Qualifications

and Curriculum Authority 2007). His dilemma about this apparent change appears to conflict with his understanding of creativity as in opposition to knowledge. This reveals the different ways that design capability (Kimbell and Stables 2008, Stables 2008, Stables 2014) is understood. His recent experience of teaching pupils that had originally opted to study one of the new fashion technical awards (AQA 2016), only to find themselves learning the single-subject GCSE (Department for Education 2015b) might explain his disposition towards change. Hetain's view of creativity as disassociated from knowledge and that textile materials can be studied from a purely process perspective limits the subject to the craft-based era of 'making' (Wakefield and Owen-Jackson 2013, Martin 2013). This view of creativity - as solely linked to non-academic work (and learners Penfold 1988) suggests potential reasons behind the guided making tasks that Choulerton (2016, 2015a, 2015b) observed as limiting the opportunities to design.

6.3.2 Navigating the process of change

This study shows that teachers resolve the day-to-day problem of moving beyond skills, making, and designing, towards a knowledge-centred curriculum (Ellis 2014, Egan-Simon 2019) by drawing on their understanding of the interplay between past rules about how pupils solve a problem and a required shift to new ways that embrace model making and design and technology capability (Kimbell and Stables 2008, Stables 2008, Stables 2014). Furthermore, the interplay of past habits of teaching one material area, despite pupils demanding a greater integration of

material solutions or the material cost of encouraging physical experimentation, inform teachers' orientation toward an imagined future of less rigid or formulaic responses to every topic. Drawing on these past and future experiences and scenarios offers teachers information about their next course of action – the encouragement and greater use of design skills and modelling (over making) and its associated risks and opportunities. For example, the move away from always making an end product, see Mary, Kerry, Mike (Sub-section 5.2.3.ii) and Steph (Sub-section 5.2.3.iii).

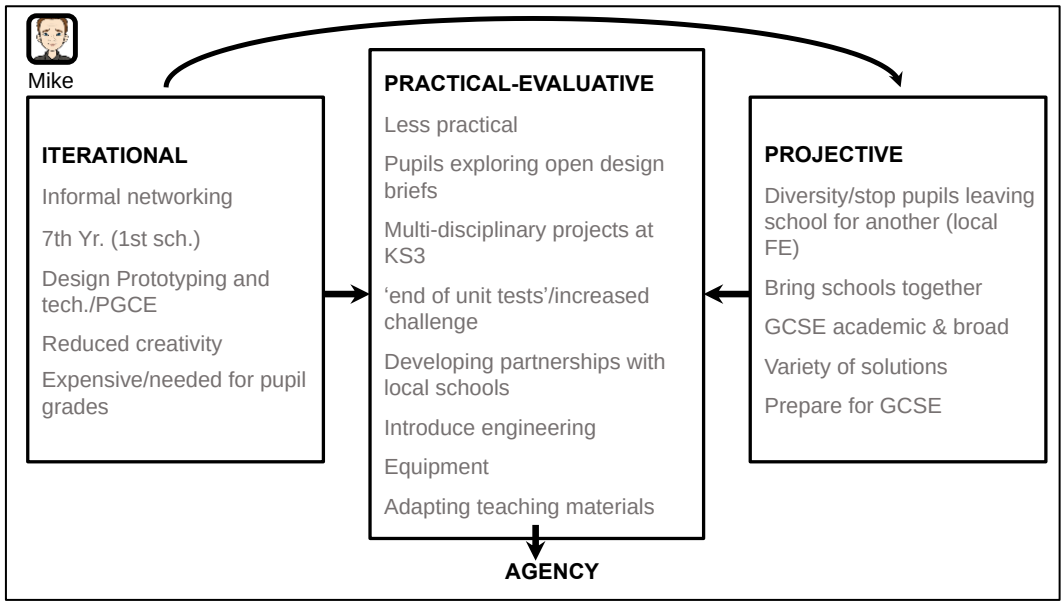


Figure 73: A model of Mike's achievement of agency.

These results explain the different ways that teachers foster authentic learning (Turnbull 2002) opportunities that prioritise contexts over products (Martin and Riggs 1999). Shifts in behaviour that shape these design and technology teachers' actions that promote practices that support iterative design and move beyond guided making tasks (Choulerton 2016, 2015a, 2015b). For example, Mike talks about getting

the pupils to explore open design briefs, see Figure 73. In addition, Alison teaches a social project in which she asks pupils to apply their design and technological capability to a local challenge – that of improving their XX City, (see Sub-section 5.2.3.i). She talks about how the pupils take ownership of the project and generate various solutions to the problem in a range of ways, for example, drawing, modelling and talking about their journey to the resolution. Alison feels guilty about the way she sees her role in the classroom is reduced to facilitator as the pupils become more autonomous in their endeavour. Alison feels a tension between her role as expert master or expert guide. This is a significant shift because it shows that the problem of teaching pupils that do not want to study the subject at a higher level forces teachers to innovate and in this case develop teaching methods that support the kind of design and technological capability that the initial policy (Department of Education and Science and the Welsh Office 1989) aimed to develop (Penfold 1988). This analysis suggests that the teachers are translating policy into practices that involve authentic design and make activities.

The reasons for adopting pedagogical approaches that promote authentic design and make are two-fold: a lack of examination pressures, and the cost of materials. First the adoption of authentic design and make activities to teach year nine pupils after they have chosen their GCSE options. This period of teaching is no longer focused on GCSE preparation and the teacher needs to plan for learners that are not intrinsically motivated to do well in the subject. For example, Alison has developed her authentic (Turnbull 2002) social project to stimulate pupils'

design thinking. She is less concerned with developing their technical skills – which she perceives as tool use and manufacturing processes. Alison interprets the project to be low stakes because the threat of GCSE performance is removed. This empowers Alison to develop authentic design and make activities that are risky. They are risky because the outcome is flexible – an unknown – that might only lead to a design idea and not a finished product. The link between curriculum content decisions and GCSE performance potentially drives teachers to play safe and avoid learning activities that might not result in concrete well-made outcomes – products. I have seen this type of low stakes challenge during my visits to schools (as an ITE tutor) when pupils are limited to engage in two-dimensional decoration decisions rather than three-dimensional construction decisions.

The second reason teachers adopt versions of authentic design and make activities is related to the cost of financing well-made concrete outcomes – products. The challenge of reducing the costs associated with making 3D products drives teachers to consider model making as an alternative. For example, Mike discusses the way he has introduced modelling into his projects to reduce the cost (and use) of materials. He recognised that the department budget had been reduced and the cost of individual pupil design and make projects has increased. The increase being linked to the use of open briefs that do not limit pupils to one material or process. Mike was driven to adopt the modelling processes, which he learned about on his ITE course, to solve the problem of mounting costs. In this example, the twin desires to keep cost down and design activities that are open for

pupils, lead to a cheaper alternative that draw on model making, which in turn, is a creative response to authentic methods (Turnbull 2002, Nicholl, et al. 2013). Mike's past experience of alternative ways to do design and make (as seen during his ITE course) have given him the agency to evaluate the present situation in light of his future aspirations.

There are still unanswered questions about how teachers might interpret policy into these practices without the push of examination pressures and budgeting constraints. What leads them to evaluate a pedagogical approach as high risk or low risk and where this might meet in the middle?

6.3.3 Present habits and routines

Another finding from the study shows that teachers resolve the day-to-day problem of increased curriculum content in the new GCSE examination by first drawing on their understanding of the interplay between past traditional curriculum organisation strategies and second, the planning of separate KS3 and KS4 content by specialists. The interplay of past habits relate to previous ITE training, see Vicky (Section 4.13). Second, through networking meetings, see Lauren (Section 4.9) and Kerry (Figure 74). Finally, through experiences of previous jobs in a collaborative department, see Charlie, (Section 4.4) and Judith (Section 4.7). Drawing on these past and future experiences and scenarios offers those teachers with responsibilities (and greater power) information about their next course of action and its associated risks and opportunities. For example, Kerry's use of morning meetings to engage the team in problem solving curriculum development issues, see Figure 74. Or Lauren's attempts to

build her team's experiences of teaching outside their specialism over time. Also, for those teachers without responsibility and less influence and power over others, there is still evidence that their next course of action evokes a change, despite perceived risks and a lack of team opportunities. For example, Vicky engages in planning meetings in her own time and Mary's mapping of the curriculum regardless of team support.

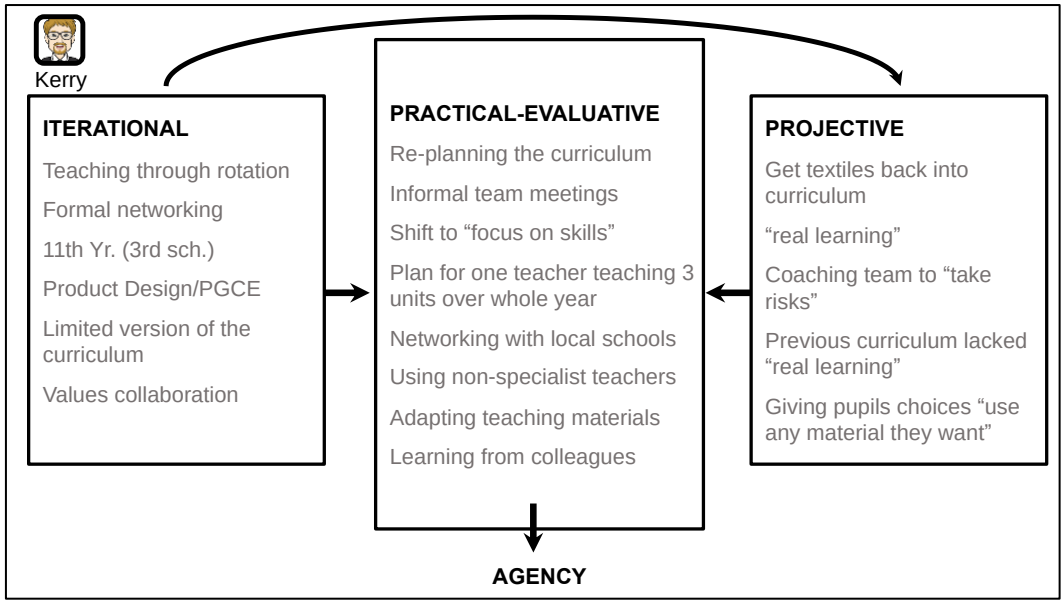


Figure 74: A model of Kerry's achievement of agency.

These results further support the idea that work contexts and teaching experiences influence changes to a teacher's role (Eteläpelto, Vähäsantanen and Hökkä 2015). Teachers who have experiences of working across material areas are more likely to have a disposition that embraces interdisciplinary actions and take intended actions towards crossing boundaries (Darby 2006, Mizzi 2021). The findings suggest that teacher preparation courses that include multi-disciplinary experiences influence moves to teaching outside the specialism that they originally

trained for (Thornton 1995, Darby 2006, Childs & McNicholl 2007, Morgan & Bourke 2008, Chapman, Wright & Pascoe 2020, Sani & Burghes 2022).

There are several possible explanations for this result. One explanation for evidence of a move to collective working could be that these teachers' values aligned with those of the multi-disciplinary ITE course they attended. Another explanation could be that teachers in their first nine years of teaching hold ideas about the subject that others who have worked in the area for longer do not share (Day and Kington 2008). The teachers' disposition towards modernisation are not clear. However, it could have something to do with the nature of design and technology being about improving things. When discussing what is wrong with design and technology, Miller and McGimpsey assert that:

> DT has not failed – it is a modern subject – it does in some ways 'meet the needs' of the 21st Century as Lady Parkes had hoped. But it has failed to go beyond merely meeting needs and helping a new generation shape the 21st Century (Miller and McGimpsey 2011, p. 14).

When discussing McGimpsey's review and picking up on themes within the National Curriculum, Miller and McGimpsey observe a discourse around modern technology and world citizenship that might explain design and technology teachers' interest in modernisation. Another explanation could be that teachers want to teach about new technology through multi-disciplinary projects that align them with a new versus old technology subject subculture, instead of a material subject sub-culture (Goodson

1998). In addition, teachers want to make change work (Fullan 2015) and believe that bringing colleagues together will make design and technology better.

Chapter 7 Conclusion

This concluding chapter summarises the key contributions of the thesis and their respective theoretical and practice implications along with suggestions for future research. There are three sections. First the research aims are answered by showing how the teachers' accounts of subject change generated a set of case studies and themes that explain the key factors influencing the translation of policy into practice. Second, answers to the research aims are used to explain how the experiences of the change process and analysis against the three dimensions of teacher agency contributed towards our understanding of the contexts and conditions that promote (rather than restrict) teachers translation of policy into practice. Finally, the limitations and implications of the study are discussed. The concluding section suggests that those teachers, that had opportunities related to ongoing professional development within a trusted community supported by positive responses to change, were able to align individual values with the collective aims of the current policy change.

7.1 How the aims were achieved

The aims of this study were to generate knowledge about the qualitatively different ways that 12 design and technology teachers, who experienced their teacher preparation course through one university provider (my own institution), responded to subject developments introduced in 2014. My analysis and interpretation of data generated through in-depth interviews with the design and technology teachers led to evidence that sought to give insight into the teachers' experiences of the change process (Fullan

2015) during the shift from the ‘valuing’ era of the subject towards the ‘knowing’ era (see Chapter 2). The subsequent analysis of the interviews against the three dimensions of teacher agency sought to understand how teachers achieved agency (Priestley, Biesta and Robinson 2015). As a result, this research has led to a better understanding of the individual, collective and departmental factors that influence these design and technology teachers’ translation of policy into practice.

- What are the specific issues and challenges that design and technology teachers face when translating policy development into practice?

The first research question was addressed both through the creation of 12 individual design and technology teacher profiles (see Chapter 4) and a thematic analysis of the collective data (see Chapter 5). Research data answered the question I had about both the qualitatively different experiences of managing a change process for individual teachers and the collective issues and challenges that teachers face in general. This study suggests that individual teachers faced issues and challenges related to:

- sharing expertise (also talked about in terms of networking and partnership);
- ‘coming off the circus’ (also talked about in terms of teaching across specialisms and staying with one teacher for the year);
- curriculum planning (also talked about in terms of mapping curriculum, top-down planning, and ‘start from scratch’);

- resources (included the use of commercial textbooks, equipment, environments and planning);
- teaching content (including conversations about mathematics, contexts, A-level at GCSE).

The individual issues identified above can lead to translations of policy that both promote and restrict the policy reform aims (see Chapter 2). A feeling that change was rushed through (at a government and school level), led to unnecessary challenges that left teachers with raised anxiety. In addition, the issue that specialist teachers felt they could no longer limit their knowledge and planning to one aspect of the design and technology curriculum suggests that teachers understand the shift in curriculum aims towards a single-subject delivery.

- What professional experiences influence different teacher responses to the challenges a policy development brings to established practice, focusing on teacher agency?

The study shows that teachers respond to policy developments in ways that are informed by past, present and future dimensions of agency. A combination of these teachers' professional histories, teaching habits and values influenced their judgements about the risks associated with any planned actions to change established practice for another. Through the thematic analysis I have demonstrated that the teachers' subject sub-culture (Goodson 1998) can be described through six themes:

- subject traditions;

- subject coherence;
- sharing expertise;
- teacher sub-culture;
- subject language;
- subject teaching.

The project answers how these teachers dealt with the change by demonstrating the different ways that teachers approached the challenge of teaching a single-subject version of design and technology with a new examination system and focus on contextual challenge. The six themes demonstrate the role of subject traditions and coherence in developing teacher intentions. Acts of agency that change over time as the context and experiences of practice, completed alone and with others, influence practice in the present. This adds to Paechter's (1995) research, which showed that when faced with the prospect of teaching across material specialisms, the teachers retreated from the subject towards subject sub-cultures (Goodson 1998) outside of design and technology. In her study, the design and technology teachers held on to their knowledge of CDT as a form of power, which often led to disengagement and the retreat of teachers, leaving the subject poorer. In addition, it seems clear from this research that opportunities for teachers to come together and share understanding and practice can lead to actions that support change. The opportunity to gain practice experiences that develop knowledge and skills both in and outside a teacher's first-degree specialism can support the understanding that Darby (2006) observes as the first step to unity and the development of the integrated knowledge (Bell et al. 2017) that is

needed to cross subject sub-culture boundaries (Darby 2006, Mizzi 2021).

7.2 Contribution to Knowledge

The research has improved understanding of the different ways that design and technology teachers translate policy into practice. The contribution to knowledge from this study includes:

1. The identification of past, present and future dimensions of design and technology teacher agency that influence teachers' understanding and responses to change (see Chapter 4, 6, and Appendix item 16).
2. The range of experiences that contribute to design and technology teachers' transformation from subject specialists to teachers that embrace shared practices and expectations (see Chapter 5).
3. The development of a diagram that describes the limited dimensions of design and technology teachers' approaches to practice in the subject (see Section 5.4, Figure 64).
4. An explanation and exemplification of a visual interview analysis method that adds to the guidance on the phenomenographical method in relation to empathetic understanding and analytical procedures (see Section 3.4.4.i, and Appendix item 15).
5. An upcoming chapter (Davies 2023) in the 2nd edition of Debates in Design and Technology Education, which include textual descriptions of three individual design and technology teacher profiles, based on Chapter 4.

7.3 How this research project supports future work as a teacher educator

A consequence of this research project, which had not been anticipated, has been the development of visual resources that can be used with trainee design and technology teachers (see Chapters 4, 6 and Appendix items 15 and 16). During the analysis stage of the research, I created a set of visual tools. The original aim of these tools was to support my initial understanding, communication and later interpretation of the data. However, the creation of the visual resources led me to reconsider the work of Buchanan (2015, p. 705), who emphasised the need 'to identify the resources individuals use to make sense of the structural characteristics in their work'. Their research called for teacher preparation courses to support student teacher self-reflection on the achievement of agency, through discussions around how this is constantly in motion. The toolkit produced in this study could therefore be used with trainee teachers to develop the kinds of dialogue needed to stimulate discussion about the role of a teacher in policy reform. This is because, the visuals (generated in this research project) identify the past and future resources that these 12 teachers used to make sense of the policy change issues in the present. Visuals that I believe have the potential to support student teacher self-reflection when thinking through the challenges of work in school.

I intend to use these resources in my institution with my trainee teachers to reflect on teacher agency. This further research can then be used to

develop guidance for other ITE provisions.

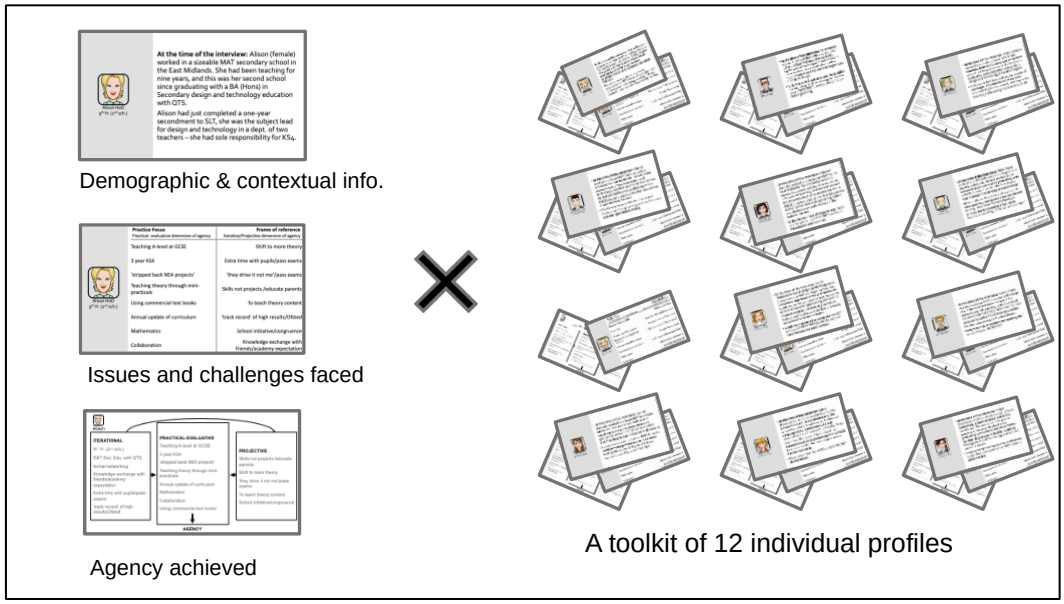


Figure 75: Diagrammatic explanation of toolkit components.

In preparation, I have compiled resources – consisting of three visual tools for each of the 12 cases:

- demographic and contextual information;
- summary of the issues and challenges faced;
- model of the design and technology teachers' achievement of agency (see Appendix item 16).

Together, these visual resources create a toolkit (see Figure 75) that has the potential to support my trainee teachers' reflection on their own and others' daily practices. The toolkit has the potential to prove useful in helping teachers to consider their values in the process of translating policy reforms into practice. I aim to use the tools, for example, in small group work where each group will focus on a different teacher's profile. Despite the threat that future teachers may find themselves '*working in*

isolation', the visual tools offer a variety of experiences that might be missing within their school (Hargreaves 2005).

7.4 Limitations, implications and future research

In this study a qualitative approach was adopted in which subjectivity, description and interpretation were emphasised, therefore the results do not report statistical data. The study focuses on participant description, and explanations that were based on the researchers' descriptions of the teachers' accounts. Therefore the results are valid but not reliable. The study represents 12 teachers who completed their ITE course with one university (the researchers) and teach design and technology across various schools in central England. Therefore the results are not representative of all design and technology teachers that completed an ITE course with the same university or school-based provider. The study represents 12 teachers who worked in either local authority or Academy Trust schools. Independent and Free Schools were not represented in the study, and therefore the results are not representative of all current school contexts in England. The study focuses on the experience of design and technology teachers working with the subject change and did not represent non-design and technology teachers or those working in senior leadership. The sample size does not allow the researcher to investigate the differences between sub-groups within the participants. For example, their age, prior experience of design and technology as a child, and if participants had children. As the sole researcher on the project and an academic working in design and technology education, the data

interpretation is subjective and therefore, another researcher might have interpreted the data differently. My professional background in design and technology education and bias towards curriculum development will have influenced my interpretations of data. However, I took steps throughout the process of analysis to bracket my ideas about the subject through the use of memos in NVivo and a personal journal of reflection (see Chapter 3).

7.4.1 Implications of the study

This study has added to the limited knowledge and understanding of the teachers that shape design and technology (Jones, Bunting and de Vries 2013) through empirical research about the different ways that these teachers have translated a specific policy development into practice. The study describes and interprets these teachers' actions to discover a more nuanced explanation of Miller and McGimpsey's (2011) accusation that design and technology teachers limit the subject's success. This study demonstrates that the issue of attributing blame to teachers is not straightforward. I agree with Miller and McGimpsey that the teachers' actions influence what happens in the classroom and how the subject evolves or repeats historical teaching methods. However, I disagree with Miller and McGimpsey that the blame for this can be placed upon teachers, which their provocation that teachers are what is wrong with the success of the subject proclaims. The answer to what is wrong with design and technology and its success is more complex. This study shows that these teachers' actions were shaped by their different agency

experiences. Agentic experiences from the past, present and future afforded opportunities and restrictions on these teachers' actions. Past activities then inform actions in the present and in turn, those in the future. Although this study begins to develop the knowledge of design and technology teachers, it is only the start. More work needs to be done, especially around the barriers to subject team dialogue and support for ITE programs. Specifically to emphasise the importance of developing theoretical and practical knowledge and skills associated with teaching both in and outside a specialism.

7.4.2 Direction for Future Research

The priority for future research is to test if these teacher experiences are unique or more widely shared across other providers. This would be needed to validate the results of this study and allow for identification of trends in the data concerning gender, age, and professional experience differences. To do this the next study would draw on a bigger participant group by utilising the knowledge of colleagues working across other ITE institutions that provide multidisciplinary ITE courses. This would require additional staffing resources to collect and process the data, and additional time for myself to set up the larger sample. To achieve this an application to my University's Scholarship Projects for Undergraduate Researchers (SPUR) Fund would need to be made. The scheme provides research assistants for small scale research projects by pairing academics with third year social science students. I would also need to attain the information about ex-trainees willing to contribute to the

research through my membership of the D&T-ITT tutors Google group, which hosts 113 international colleagues working across various fields of ITE (Spendlove 2022). The proposed research could be carried out during the summer term of 2023 after teachers have taught two years of the GCSE course and KS3 post COVID-19 measures. The increased sample size and added knowledge about trends associated with demographic characteristics would enhance the validity of the data and identify any flaws in the original study.

I have come to the final paragraph of this thesis. In the preceding chapters, I have reported on the impact of policy reform on design and technology teachers' work and how different factors influence design and technology teachers' capacity to translate policy into practice. I have approached this in three ways: through engagement with design and technology literature and policy, through the presentation of empirical research that offers 12 concrete cases where teachers tackle with the issues of teaching their subject within the context of policy reform, and through theoretical development and reflection. I have shown that the critical factors that influenced the translation of policy into practice for these teachers was the level of opportunity and risk associated with embedding new traditions within an existing practice. And I have made a case for why design and technology teacher agency matters and why the promotion of teacher agency at - an individual and collective level - may contribute to countering the historical repetition of old-fashioned teaching methods. For example, by opening up the subject to the whole subject sub-culture, and a shared aesthetic approach to subject knowledge. In

addition, I have development a toolkit of visual resources that will be used to engage future design and technology teachers in discussions about their role in the subject's development.

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Appendices

Appendix 1 First-cycle descriptive codes assigned in NVivo

Specific acts, behaviours - accounts of specific actions, behaviours (what people do or say)	**files**	**references**
assessment	9	31
planning	12	142
professional development	8	21
teaching	10	47
Meanings - a wide range of phenomena at the core of much qualitative analysis. meanings and interpretations are an important part of what directs participants' actions.	**files**	**references**
giving pupils power	2	2
value	3	3
vocational education	4	4
'scheme of work'	1	1
concept-basic knowledge	1	3
concept-basic skills	2	4

curriculum materials	7	11
design and technology core	12	42
homework	4	5
key stage-3yr ks4	1	2
ks-3	7	21
ks-4	6	6
making a product	5	5
NEA	3	7
rotation-food textiles	2	2
rotation-rm graphics electronics	1	1
specialist-graphics	1	2
subject classification	6	6
subject-art and design	3	6
subject-design and technology	9	26
subject-engineering	2	12
subject-food	12	107
subject-graphics	5	6

subject-product design	12	235
subject-rm	5	6
subject-textiles	12	148
theory vs practical	4	7
States - general conditions experienced by people or found in organisations	**files**	**references**
'on board' culture	1	2
ambivalent	1	2
confident	5	9
difficult challenge	4	6
feeling happy	1	1
flexible working conditions	3	6
loving teaching	3	3
negative	7	12
non-specialist working conditions	4	8
open to subject change	3	3
positive	8	14

pressure	4	4
problem	3	5
recognition	1	2
teacher confidence	2	3
tension	1	1
weak	1	1
working hard	8	15
working in comfort zone	1	1
Activities - these are for a longer duration than acts and often take place in a particular setting and may have several people involved	**files**	**references**
choosing an exam board	5	13
learning new specialism	5	14
learning-trial & error	4	5
monitoring quality	2	2
‘not doing projects’	5	9
Strategies, practices or tactics - accounts	**files**	**references**

of strategies, practices or tactics **(activities aimed towards some goal);**		
planning-curriculum coverage	3	6
planning-food	1	1
recruiting design and technology teachers	3	9
resourcing the subject	1	1
sharing curriculum time	8	15
staying with pupils	4	17
subject rotation	9	25
teaching -food	1	1
teaching beyond specialism	9	36
teaching maths & science	4	9
teaching specialism or core	6	7
teaching-cad	2	2
teaching-content knowledge	5	11
teaching-design and make	11	29
teaching-mainly designing	2	2

teaching-practical skills	7	9
work together	7	45
Consequences - accounts of consequences (what happens if …);	**files**	**references**
class size	1	2
creative elements	1	1
embedding knowledge	2	3
growing	1	1
open teaching leads to pupil engagement	1	1
own time	4	4
pupil progress	7	15
pupil engagement	2	2
pupil learning	8	13
redundancy	1	1
resources improve teaching	2	2
sketchbooks vs worksheets	1	1
stopping textiles	1	1

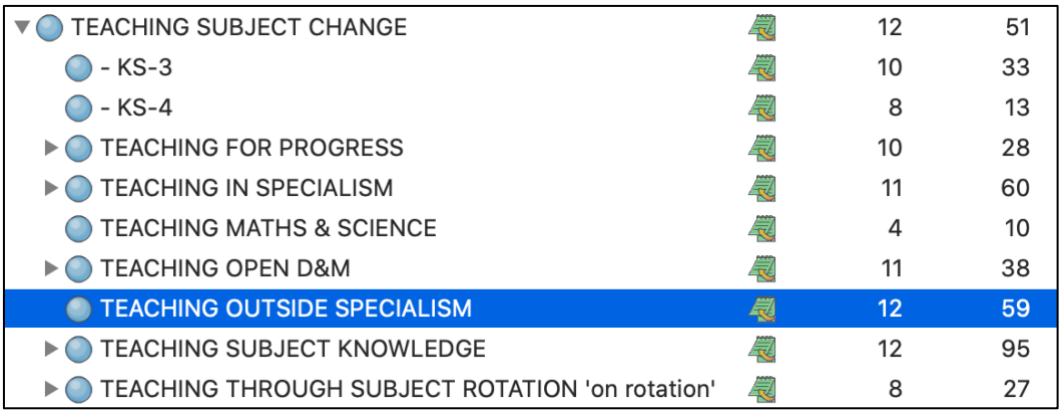
taking something home	2	3
voluntary contribution	3	4
Conditions or constraints - the precursor to or cause of events or actions, things that restrict behaviour or action;	**files**	**references**
accountability	3	10
budget	5	10
consistency	2	3
curriculum coverage	8	15
gendered subject	3	3
new staff	2	2
option choices	9	20
results	4	5
staff changes	2	4
support from leadership	1	1
teacher observation	1	1
time	6	14
timetable	3	6

tracking pupils	4	6
Relationships or interaction - between people, considered simultaneously;	**files**	**references**
community	3	5
fitting in	2	2
learning from colleagues	1	2
meeting as a team	11	24
networking	6	22
other teachers	2	3
power struggles	4	4
sharing	5	10
talking about work with others	3	6
working as a team	11	41
Settings - the entire context of the events under study;	**files**	**references**
classroom	6	10
department	1	3
outside school	5	6

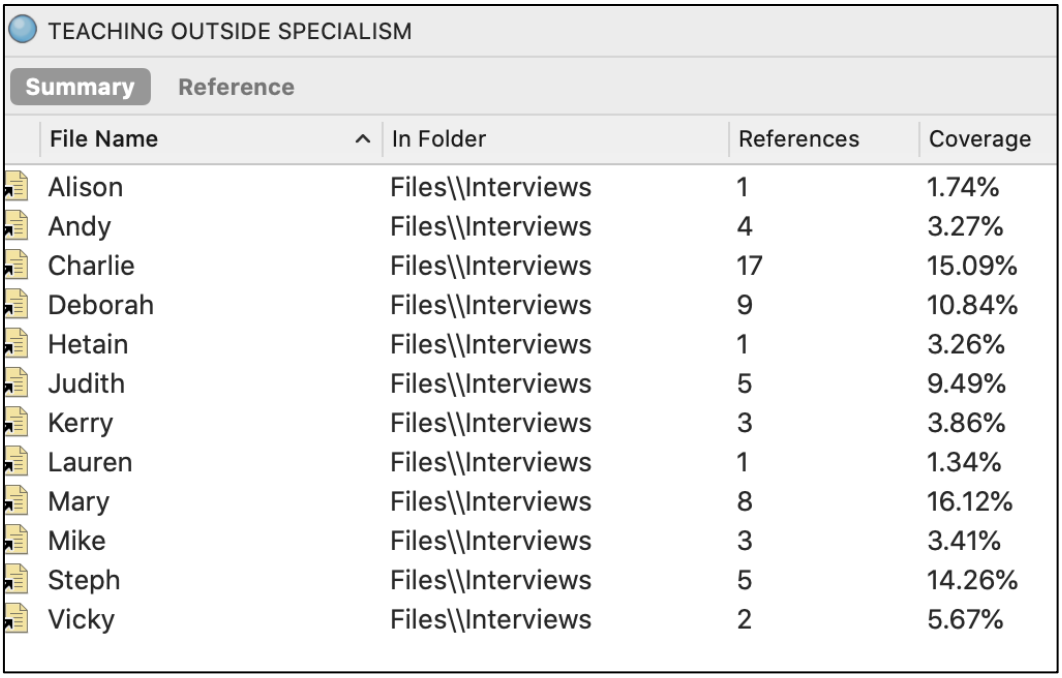
parents	3	4
school	1	1
wild cards (not linked to a code)	3	5

Appendix 2 Example description and codes

TEACHING SUBJECT CHANGE	The theme 'teaching in and outside a specialism' explores the issue of teaching a defined material area versus teaching outside a defined material area.	12	51



Screenshot of TEACHING SUBJECT CHANGE sub-codes.



File Name	In Folder	References	Coverage
Alison	Files\\Interviews	1	1.74%
Andy	Files\\Interviews	4	3.27%
Charlie	Files\\Interviews	17	15.09%
Deborah	Files\\Interviews	9	10.84%
Hetain	Files\\Interviews	1	3.26%
Judith	Files\\Interviews	5	9.49%
Kerry	Files\\Interviews	3	3.86%
Lauren	Files\\Interviews	1	1.34%
Mary	Files\\Interviews	8	16.12%
Mike	Files\\Interviews	3	3.41%
Steph	Files\\Interviews	5	14.26%
Vicky	Files\\Interviews	2	5.67%

Screenshot of TEACING OUTSIDE SPECIALISM summary.

areas and then we divided that up and then we looked at introducing that into our projects because it was project based at first. Errmm and then gradually that's developed so that it just fits in now.

Reference 3: 1.95% coverage

Kerry: No, I think everyone in our team at the moment are keen to get involved in all material areas. I don't think we'd have a problem with that. You know, if we said next year, we've got Food, we've got Design Technology, we've got textiles with our current staffing would we do it could we do it? Yes, the answer is 100%. Because the staff I've got would. But, I'm losing a member of staff, who currently teaches some of the textiles which is why there's a need for kind of that extra member of staff and it just seems like an ideal opportunity to look at the curriculum as a whole and why just end at Key stage 3 into Key stage 4. Why not get someone that's got that specialism that could potentially go into the Design and Technology at A' level with the textiles and fashion. Can't remember if its textiles and fashion off the top of my head, but,

Files\\Interviews\\Lauren
1 reference coded, 1.34% coverage

Reference 1: 1.34% coverage

Lauren: No, we rotate. We keep specialist but what I would say is I purposefully said to my staff two years ago, I'd give them one more year of working in their own comfort zone and then I would be putting them in to teach other areas to make them broaden their own skills. So like I've had my textiles teacher that's never done anything other than textiles and food. She's had to teach year 8 programming this year. To make them have to learn other skills. I've done all areas now. Food, textiles, electronics.

Files\\Interviews\\Mary
8 references coded, 16.12% coverage

Reference 1: 2.02% coverage

All of the year 7's started with a graphic project. And they did that up until Christmas. And then, whatever teacher they were with, they would then spend the rest of year 7, learning

Files\\Interviews\\Deborah
9 references coded, 10.84% coverage

Reference 1: 0.24% coverage

Deborah: We were already teaching in product design rather than separate R M, graphics, electronics, and ...

Reference 2: 1.04% coverage

Deborah: At key stage four and at key stage three so we have always taught a very mixed [emphasis] curriculum at key stage three errmm ...we have always been apart from a trial probably about four or five years ago we have always been a mixed ability. We have always been in very mixed at key stage three with materials, so if there were doing for example a Mood light project, they would be using some electronics and then would perhaps be shaping some acrylic to put them together.

Reference 3: 1.45% coverage

Screenshots of TEACHING OUTSIDE SPECIALISM references.

Appendix 3 Consideration of research purposes

The blue cells on this sheet must all be completed to provide your details and to name respond to the appropriate questions asked. Please note that some cells will ask you to use a drop-down box to supply your answer. Once you have answered all the questions you should submit this spreadsheet by email to educationresearchethics@nottingham.ac.uk with the other ethics documents required for the submission (see Tab 2). You need to ensure your submission is copied to your supervisor/host.			
1	Your name	Sarah Davies	
	Student/staff status	EdD Student	
	Supervisor(s)/host	Dr Debra Costley	
	Student ID	4262614	
	Your contact email	mailto:Sarah.Davies1@nottingham.ac.uk	
	Project Title	An investigation into design and technology teachers' experience of subject enactment.	
	Where will your research take place?	Within the UK	
	If any of your research is to be conducted outside of the UK you will need to follow local ethical requirements. Use this space to confirm your understanding of local requirements.		N/A
	A DBS check is required if your research will involve the researcher being left alone with children and/or vulnerable adults. Does this project need a DBS check to be carried out?		No
	What is your DBS number?		N/A
	Is there external funding for this research?		No
	If this research is funded by external sources please indicate the funder and project code		N/A
	For students and visiting scholars only:		
	Your main supervisor/host needs to be involved in the preparation of and approve this ethics submission. Use this space to advise how this has been done.		This application has been developed in consultation with my lead

			supervisor Dr Debra Costley.
2	1a	Is the research with non-vulnerable adults in private interactions?	Yes
	1b	Is the research concerned with a non-sensitive topic?	Yes
	1c	Is the research of completely anonymous participants (with no identifying information recorded)?	No
	1d	Is the research taking place in a public physical or virtual space where participants might reasonably expect that their behaviour is observed (eg web presence that is not restricted access in any way)?	No
	1e	Is the research involving openly available secondary data (eg government archives)?	Yes
	2a	Can you confirm that there is no gatekeeper involved?	Yes
	2b	Can you confirm that there is a gatekeeper and you are assured that there is no pressure placed on potential participants to be involved?	N/A
	3a	Can you confirm that you do not have a current or prior relationship with participants?	No
	3b	Can you confirm that where there is a current or prior relationship that the decision whether or not to participate will have no bearing on their relationship with you?	Yes
	4	Can you confirm that if participants are your own students that they have been informed of the research and they are aware that they can withdraw from participation?	N/A
3	1	Does the study involve children described as 'typically developing children in mainstream settings' (ESRC, 2015: 8)	No
	2	Does the study involve personal data, for example relating to age, gender, ethnicity, religious affiliation, sexuality?	Yes
	3	Does the data involve discussion of sensitive issues such as mental health issues or sexual activity?	No
	1	Does the study involve vulnerable participants? (vulnerable children, people with learning difficulties, mental health issues)	No

4	2	Does the research involve participants not providing consent, deception or covert observation in any form?	No
	3	Might the study generate a level of stress of anxiety above that which might be expected from normal social interactions?	No
	4	Does the study involve discussion of sensitive issues with the possibility of personal disclosures concerning their involvement in illegal activities or activities likely to cause harm (sexual activity, substance abuse, professional misconduct)?	No
	5	Does the study involve the public use of data that might result in participant identification? (eg audio or video data that is used for purposes beyond basic data analysis by the research team)	No

5	1	Please provide a brief description of the project and its aims	My project is about the lived experience of design and technology secondary teachers as they enact the subject curriculum. The project aims to investigate the ways in which design and technology teachers achieve (or not) agency through their day-to-day working practices.
	2	Please identify the intended participants indicating how they will be selected and approached	The participants will be a purposive sample of 10-15 alumni design and technology teachers from the researchers institution. They will be approached through email (email communication attached).
	3	What types of data will be collected and what methods of data collection will be used?	Interview data will be collected through semi-structured, face-to-face interviews over the next academic year. The interview data will be audio recorded and later transcribed using a university approved transcription service.
	4	How will data be stored and used?	The data will be securely stored on a pass-word protected university managed storage system for up to 7 years after the thesis publication. Data will be used to generate codes/themes for analysis. Identifying data will be kept separate from the transcripts.
	5	Based on responses to questions in Sections 3 to 5, please identify potential risks associated with this research and the steps taken to mitigate these risks.	Due to the nature of interview the teachers may say negative things about their experience and department. I will need to reassure participants that their interview conversations will not be identifiable.

On the basis of the answers you have provided below your ethics submission is indicated to be:	**Above minimal risk**
A submission above minimal risk can be low risk or high risk. This submission is indicated to be:	**Low risk**

Appendix 4 Research instruments

Time of Interview:	Interviewer:
Date:	Interviewee:
Place:	Teaching role/s of interviewee:

Project Description

This project is about the lived experience of design and technology teachers. The project aims to investigate:

- In what ways are design and technology teachers, from Initial Teacher Education (ITE) courses with one English University, finding; understanding; and practicing design and technology within subject departments?
- How are subject department cultures, structures and resources influencing design and technology teachers' experience of day-to-day working practices?

Interview Questions:

1. How do you find teaching design and technology (GCSE/KS3) curriculum?
2. Do you feel that you get to cover all the curriculum you want to teach currently?
3. Can you tell me about how you teach design and technology e.g. the different pedagogical approaches that you adopt?
4. How do you plan/deliver design and technology curriculum across the department?
5. Can you tell me about any opportunities that you feel have benefitted your practice?

Thank the individual for participating in this interview. Assure him or her of confidentiality of responses.

Appendix 5 A series of communications with my participants

Initial Email Communication

Dear Colleague,

I am currently undertaking a research study supported by the School of Education at the University of Nottingham examining design and technology teachers' experiences of teaching the subject. I write to ask if you would be prepared to let me interview you on the subject of your involvement in teaching secondary design and technology. The research focus is on the nature of teaching the subject from the perspective of teachers that completed their teacher education with one English university provider and I would be really interested to hear your experiences. By telling me your story I hope to be able to identify the things that have helped and hindered your progress in curriculum delivery. I am hoping that the insights gained will help inform future policy and practice in relation to the factors that promote, or restrict, different teachers' capacities to teach design and technology within subject departments. If you would be prepared to be interviewed please respond by email and I will arrange a time and place convenient to you to meet.

I value your participation and thank you for the commitment of time, energy and effort.

Regards

Sarah Davies

Interview day

Then a more formal letter presentation will be reproduced for the day of the interview for participants (Information for the Participant) to read and a consent form given to sign before the interview commences.

Appendix 6 Consent form

Project title: An investigation into design and technology teachers' experience of subject. enactment

Researcher's name : Sarah Davies

Lead Supervisor's name : Associate Professor Debra Costley

Secondary Supervisor's name : Professor Bernadette Youens

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that I will be audiotaped during the interview, but that I can refuse to be recorded and to have the interview recorded in handwriting.
- I understand that data will be stored in a locked cupboard in a locked room and password protected computer file, with only the researcher and supervisors having access to it. Personal details will be separated from results by the use of coding and

pseudonyms to protect confidentiality. Data will be kept for no longer than seven years after publication of any findings.

- I understand that I may contact the researcher or supervisor if I require further information about the research, and that I may contact the Research Ethics Coordinator of the School of Education, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.

Signed ……

(research participant)

Print name ……

Date …… Contact details

Researcher: Sarah.Davies1@nottingham.ac.uk

Lead Supervisor: Debra.Costley@nottingham.ac.uk

Second Supervisor : bernadette.youens@nottingham.ac.uk

School of Education Research Ethics Coordinator: educationresearchethics@nottingham.ac.uk

Appendix 7 Information for the participant

The Purpose of the Research

This research forms part of a doctoral study in the School of Education at the University of Nottingham and is focused on the lived experience of design and technology teachers as they enact subject curriculum. The aim of the research is to better understand the factors that promote, or restrict, teachers' capacities to enact design and technology curriculum. You are invited to discuss specific episodes, situations, or events that you have experienced in planning and adapting teaching materials, pedagogical approaches and assessment processes, in relation to teaching the subject. I am seeking vivid, accurate and comprehensive portrayals of what these experiences were like for you: your thoughts, feelings and behaviours, as well as situations, events, resources and people connected with your experience. This study concentrates on design and technology teachers that completed their initial teacher education at one University and that are currently teaching the subject in secondary school. Individual design and technology teachers will be interviewed in order to capture their shared experiences.

Expectations of Participants

You are invited to describe your experience in an semi-structured interview, approximately 60 minutes in length. This is voluntary and you are free to withdraw at any time, with no negative consequences, non-participation will not affect your organisational or educational standing. If you decide to proceed, I will ask to audio record the interview, so that no

comments are lost, but you have the right to refuse this recording. The interview will include questions about your experiences with teaching the curriculum and the decisions you have made about lesson content and ways of working within your department. This is an open conversation between the two of us to allow you to express your ideas and any concerns. Data will be stored in a secure place and your name will be coded and changed to ensure anonymity and confidentiality. Only my supervisors and I will have access to the information obtained from you. It will be kept in a locked cupboard in a locked room. Comments you may be quoted but anonymously. A consent form is provided for you to sign before the interview.

Findings

Once the data is analysed you will be given the chance to read the transcript for accuracy. The generalised results will be summarised and feedback will be made available at the end of the study. Recommendations will be made to improve future practice and policy within design and technology education.

Contact Details

If you have any queries or concerns about the research you can contact the researcher or her supervisors or the department of education.

Researcher: Sarah.Davies1@nottingham.ac.uk

Lead Supervisor: Debra.Costley@nottingham.ac.uk

Second Supervisor : bernadette.youens@nottingham.ac.uk

School of Education Research Ethics Coordinator:

educationresearchethics@nottingham.ac.uk

Appendix 8 Thank you email to participant

Project title: An investigation into design and technology teachers' experience of subject change

Thank you for meeting with me in a semi-structured interview and sharing your teaching experience. I appreciate your willingness to share your unique and personal thoughts, feelings, events and situations.

I have enclosed a transcript of your interview. Would you please review the entire document. Be sure to ask yourself if this interview has fully captured your experience of teaching the subject. After reviewing the transcript of the interview, you may realise that an important experience(s) was neglected or is factually incorrect. Please feel free to add comments, using the 'Review' setting in word, that would further elaborate your experience(s), or if you prefer we can arrange to meet again and audio record your additions or corrections. Please do not edit grammatical corrections. The way you told your story is what is critical.

When you have reviewed the verbatim transcript and have had an opportunity to make changes and additions, please return the transcript as an attachment, to myself at Sarah.Davies1@nottingham.ac.uk.

If you have any questions or concerns, do not hesitate to get in touch at Sarah.Davies1@nottingham.ac.uk

Regards

Sarah Davies

Appendix 9 Ethics approval

I sent for ethical approval on the 30 August 2018. The proposal was successful. On the 19 September 2018 the ethics panel wrote:

Dear Sarah Davies

Thank you for your research ethics application for your project: An investigation into design and technology teachers' experience of subject enactment. Our Ethics Committee has looked at your submission and has the following comments.

- This is a well-constructed protocol and series of emails and information sheets.

However, the Committee makes the following observations:

- There is no mention of the GDPR Privacy notice in this application. This should be part of the ethics process/documents and so will need explaining to participants.
- Why are the respondents being asked not to correct grammatical points when they review their interviews? Why shouldn't they be allowed control over the way their story is told as well as what they chose to disclose? There's a difference between spoken and written language and it seems reasonable to me to give respondents the option of changing the way they put things when they see the transcriptions. (Note: This is a very minor point for you to think about; we do not ask for any response from you.)

Based on the above assessment, it is deemed your research is:

- Approved

We wish you well with your research

Prof John Holford Ethics Committee

Appendix 10 Amendment to ‘Thank you email to participants’

I have enclosed a transcript of your interview for review. Could you check that it says the right things, e.g. I have captured the correct facts about Year groups, project foci, etc.? Please do not worry about the verbatim nature of the transcription. This is just the way I have to do it for my course. The way you tell your story is what is critical. If you spot any factual errors or feel an essential experience(s) is missing, please feel free to add the changes using the ‘Review’ setting in word.

Appendix 11 Research participant privacy notice

Privacy information for Research Participants

For information about the university's obligations with respect to your data, who you can get in touch with and your rights as a data subject, please visit: https://www.nottingham.ac.uk/utilities/privacy.aspx.

Why we collect your personal data

We collect personal data under the terms of the University's Royal Charter in our capacity as a teaching and research body to advance education and learning. Specific purposes for data collection on this occasion are a doctoral study in the School of Education at the University of Nottingham focused on the lived experience of design and technology teachers as they enact subject curriculum.

Legal basis for processing your personal data under GDPR

The legal basis for processing your personal data on this occasion is:

- Article 6 (1a) consent of the data subject.

Appendix 12 Interview guide

Date of Interview:
Time of Interview:
Interviewer:
Interviewee:
Place of Interview:

Read through: information for the participant

This project forms part of a doctoral study in the School of Education at the University of Nottingham. The project focusses on the lived experience of design and technology teachers and the role they play in shaping a subject. I am interested in teacher's day-to-day working practices and what they think are the mechanisms that empower them to do this. And I am also interested in how teachers feel about and make sense of what they teach and how that in turn influences what they do and who they do it with. This means that the questions all deal in some way with the general topic of teacher's practice.

Here is the consent form, which I will ask you to fill in and sign at the end of the interview, including the privacy notice. Have a look through the form and make sure that you are happy with what is on there. If there is anything, you do not understand then please ask me. When you are happy, you can pass me the form back and I will give you it to you again

at the end of the interview for you to fill in and sign.

Demographic Information: Iterational experiences (part 1)

Details of teachers and schools involved in the study.

What is your present job description? And what age groups/material specialisms do you teach?	Head of department Curriculum/Key Stage lead Class teacher Key Stage 3 | Key Stage 4 | Key Stage 5
Can you describe the kinds of T&L professional development opportunities that are available to you, through your school?	Staff learning groups Team meetings MPQH/L Qualifications Masters Modules Research projects External courses
How would you best describe the school you work in? Type Performance Location	Local Authority Large/Small Academy Trust Free School Grammar School Private School Faith School Specialist School Other Low, medium, high performance Rural, suburban, inner-city; ex-mining;

Issue/topic	Possible Question	Possible follow up questions	Probes
DESIGN AND TECHNOLOGY Curriculum, pedagogy and assessment	Can you tell me about something, in your day-to-day practice, that has changed as a consequence of the new curriculum at Key Stage 3/4? What sort of new projects/content have you developed for the new curriculum?	What was your reaction to the change? How did the new project impact on your teaching? How did the new project impact on your planning?	Tell me more about that (why)? I am curious about that change? And then?
Reactions to the change of curriculum policy	Can you tell me about how you and/or the team went about deciding on what gets taught? Do you have aspirations/goals for the subject?	What did you actually do (nuts and bolts)? How did delivery and/or assessment change? What do you think influenced/influences these aspirations/goals?	And …? Can you tell me more? Can you give an example?
Perceptions of their role in shaping curriculum/curriculum development	Do you feel able to influence teaching in D&T? Should teachers play a role in curriculum development?	In what way? Why do you think they should/shouldn't?	Can you give an example? Go on. Really?
School structures/cultures	Can you tell me about how much power you have to plan/change the curriculum? Can you tell me about what is	How do you evaluate changes to curriculum, pedagogy and assessment? In what way?	Can you give an example? Can you say something more? Really?

	possible in relation to curriculum planning in your school? Do you feel able to take risks with what you teach?	How do other people in the department support this?	

Demographic Information: Iterational experiences (Part 2)

Details of teachers and schools involved in the study.

After Interview	
How long have you taught DESIGN AND TECHNOLOGY in secondary school?	Years = Schools =
What is your gender?	M | F | GN
What first degree to you have? Any other academic/professional qualifications?	BA/BSc MA/PHD

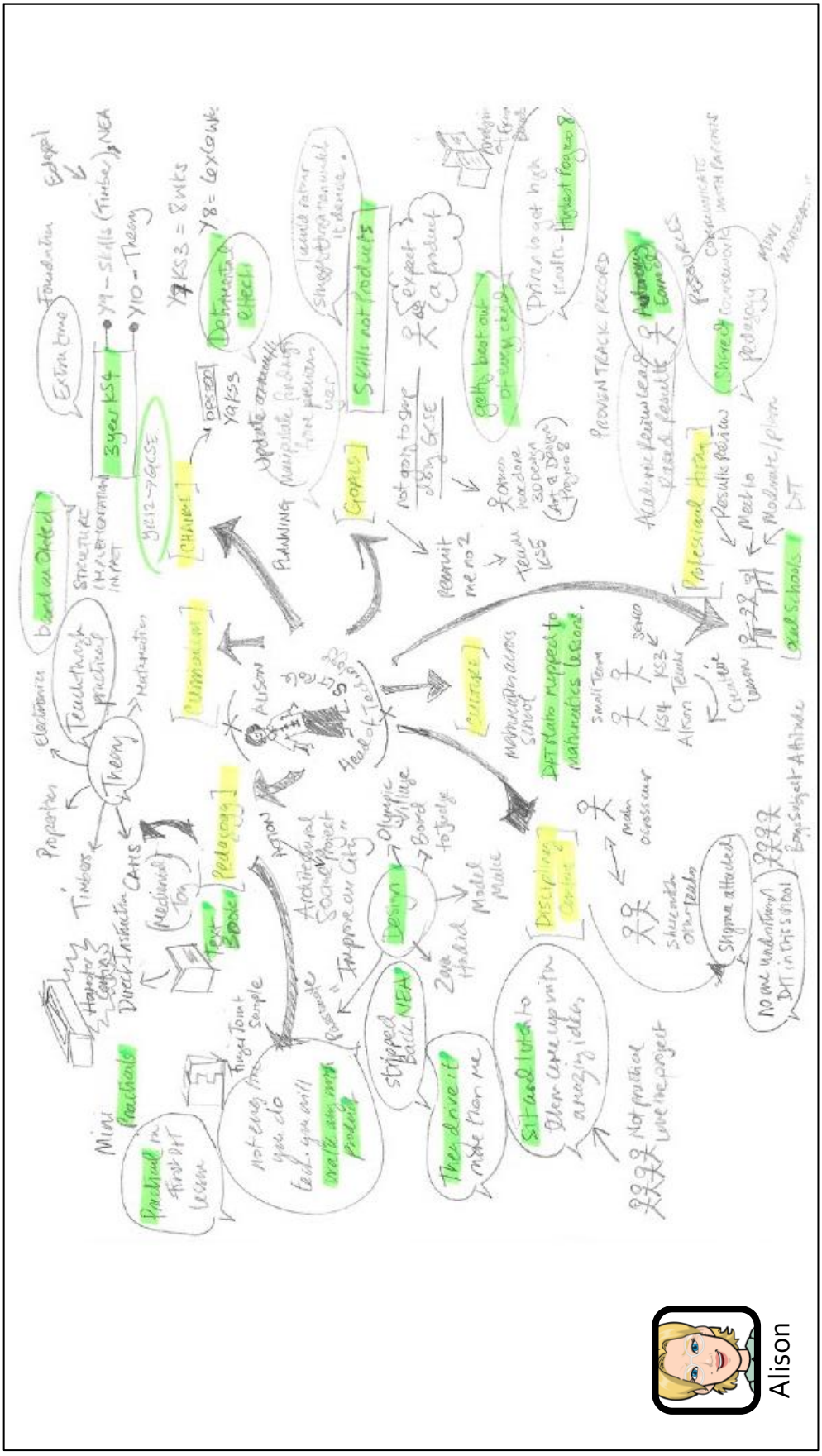
Appendix 13 Transcription conventions

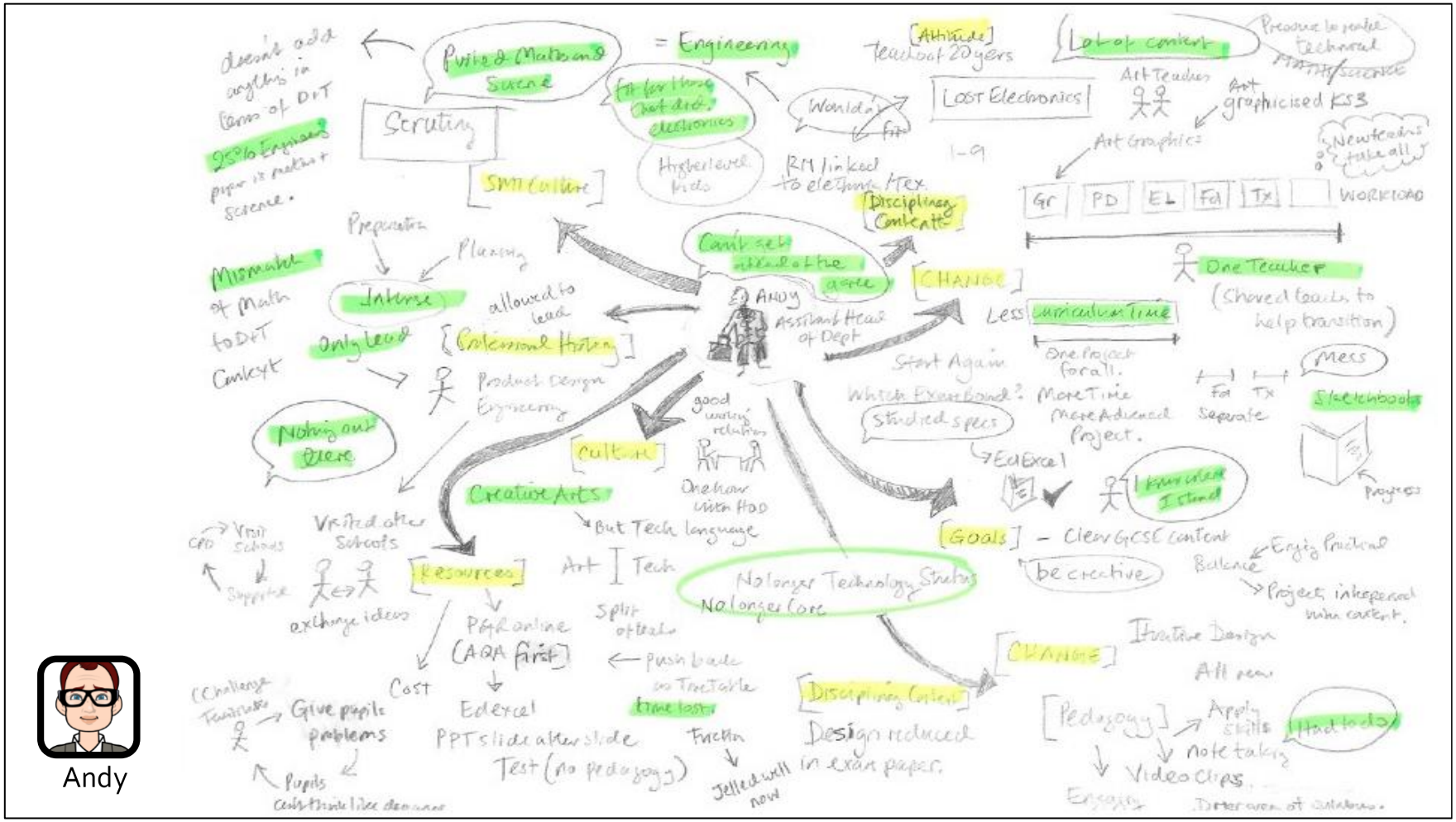
	Convention
record hesitation, small or long pauses, and silences;	three dots (…) in the text
recording inflections and tone of voice (rising to falling), e.g. writing down the mood of the speaker or the speech at the time: anger, anxiety, sadness, excitement, questioning, hesitance etc.;	(hesitance)
volume of the speaker (quiet to loud, whisper to shouting);	(loud)
recording the speed of the speech (slow to fast, hurried to calm);	(fast)
breaks (sudden to considered) in speech;	(sudden break)
stresses and phases in the speech;	(stressed)
audible breathing out or breathing in;	(deep breath)
non-verbal activity (e.g. standing up, leaning back, etc);	(goes for glass of water)
record uninterpretable noise (e.g. the words in brackets 'noise' or 'unclear noise');	'unclear noise'
record several speakers who are all speaking at the same time (e.g. the word 'together' after each speaker's name);	'together'
being consistent in spelling (so that search and retrieval can be facilitated, particularly if software for this is used, discussed later);	

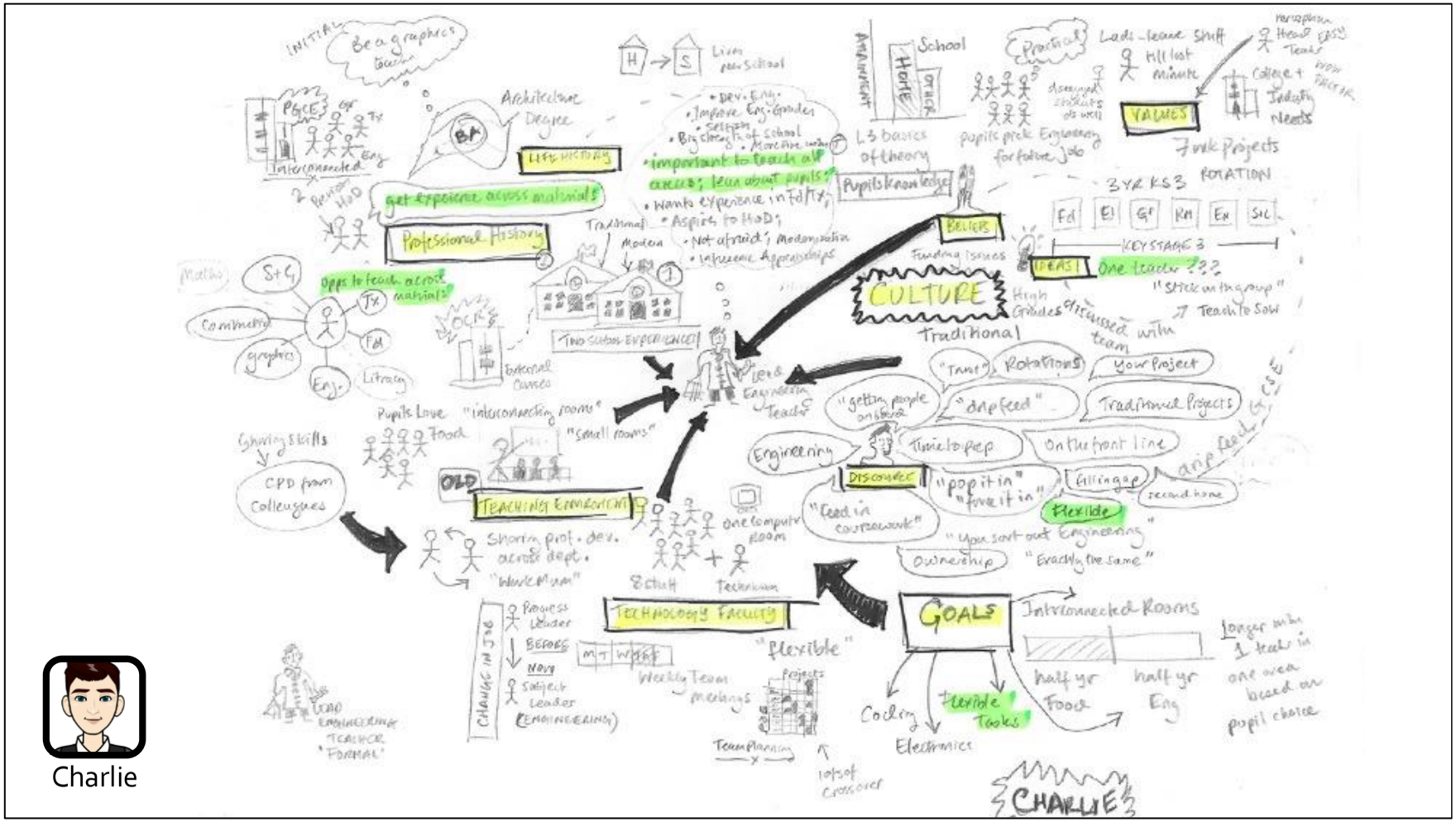
Appendix 14 Participant data

	School type	Yr. teach	School history	First-degree/QTS	School role
Cases\\Alison	AC	9th	2	D&T Secondary Education with QTS	HoD
Cases\\Andy	AC	8th	1	Product Design/PGCE	Engineering Subject Lead
Cases\\Charlie	AC	7th	2	Architectural Studies/PGCE	Engineering Subject Lead
Cases\\Deborah	AC	10th	1	Textile Studies/PGCE	HoD
Cases\\Hetain	LA	11th	1	Graphic design/PGCE	Full-time teacher of D&T
Cases\\Judith	A	11th	2	Fashion & Textiles/PGCE	Part-time teacher of D&T
Cases\\Kerry	AC	11th	3	Product Design/PGCE	HoD
Cases\\Lauren	AC	9th	1	Interior Architecture/PGCE	HoD
Cases\\Mary	LA	3rd	2	Fashion Knitwear/PGCE	Full-time teacher of D&T
Cases\\Mike	FS	7th	1	Design Prototyping and technology/PGCE	Full-time teacher of D&T
Cases\\Steph	A	5th	2	Textiles, clothing management and technology/PGCE	Part-time teacher of D&T
Cases\\Vicky	AC	4th	2	D&T Secondary Education with QTS	Full-time teacher of D&T

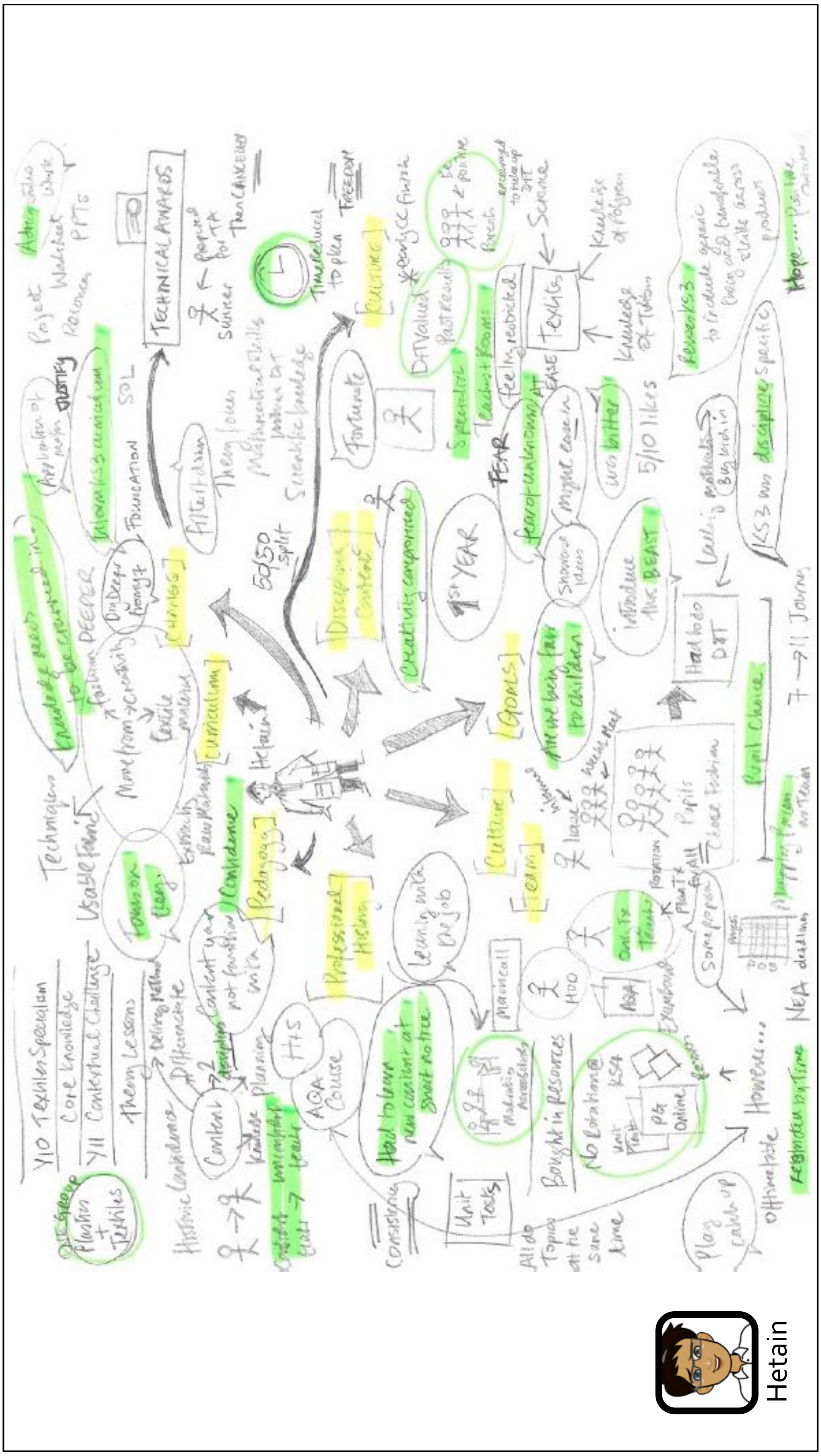
Appendix 15 Individual profiles



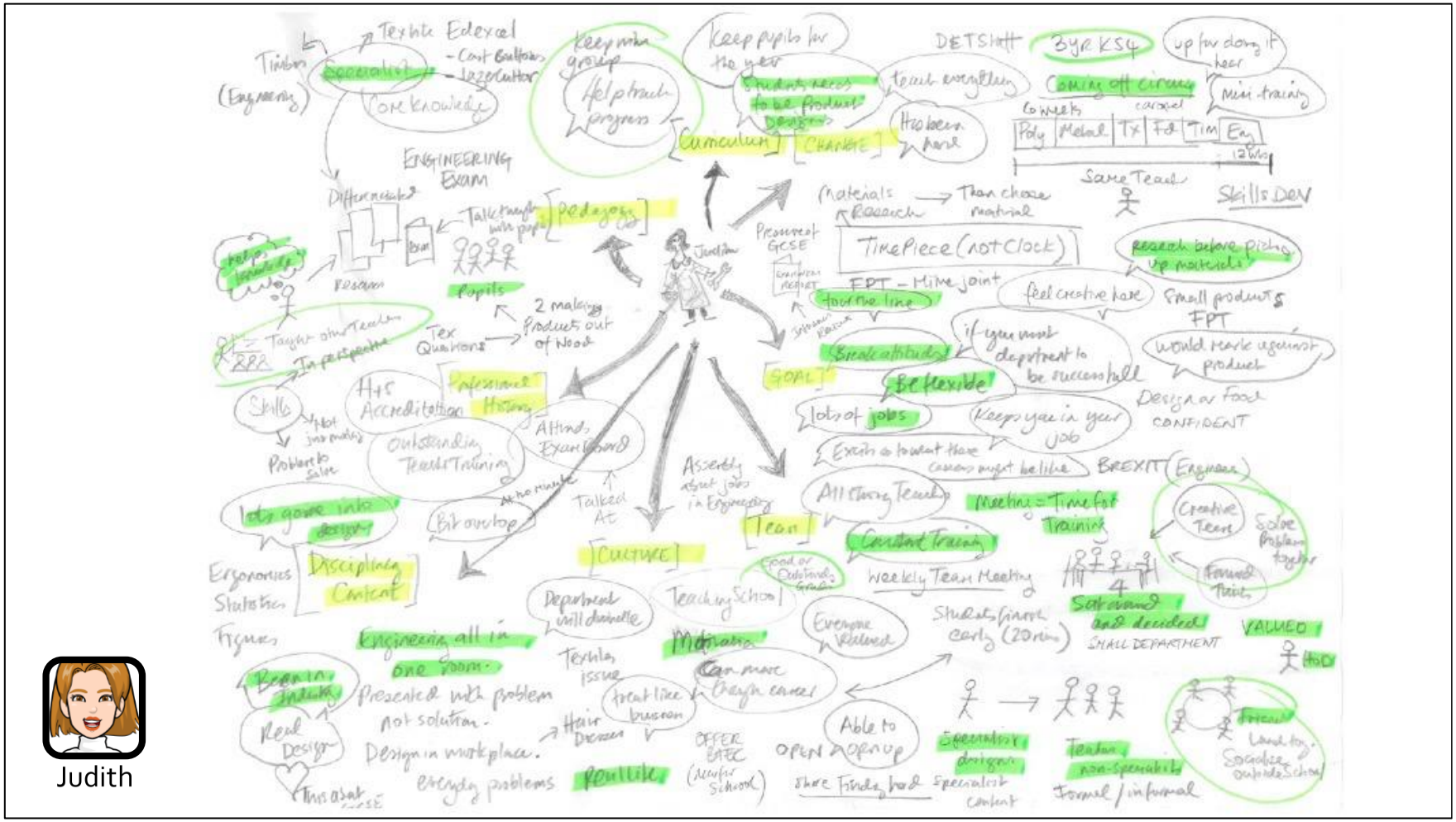

Andy
Scrutiny
Pure & Maths & Science
= Engineering
Attitude
Teachers 20 years
Lot of content
Art Teacher
Art graphicised KS3
Lost Electronics
Art Graphics
Gr
PD
EL
Fd
Tx
WORKLOAD
One Teacher
(Shared teams to help transition)
ANDY
Assistant Head of Dept
Intense
Only Level
allowed to lead
Product Design
Engineering
Creative Arts
Art
Tech
But Tech language
Resources
Cost
Edexcel
PPT slide after slide
Test (no pedagogy)
Give pupils problems
Pupils
Challenge
Teachers
Visited other Schools
exchange ideas
PGR online
(AQA first)
Split offers
push back on Timetable
time lost
Friction
Jelled well now
Nothing out there
Culture
One how with Head
Start Again
Which Exam Board?
Studied specs
More Time
More Advanced Project.
One Project for all.
Less curriculum Time
CHANGE
Mess
Sketchbooks
Separate
Edexcel
Goals
- Cleve GCSE content
be creative
Balance
Engg Practical
Project interspersed with content.
No longer Technology Status
No longer Core
Discipline Content
Design reduced in exam paper.
Iterative Design
All new
Pedagogy
Apply skills
note taking
Had to do
Video Clips
Engage
Mismatch of Maths to DnT Context
Preparation
Planning
doesn't add anything in terms of DnT
25% Engineers paper is maths + science.
Procedure to make technical
Newtonian's take all
Higher level kids
RM linked to electronics Mtex
Disciplinary Content
Context


INITIAL
Be a graphics teacher
PGCE
Interconnected
Architecture Degree
BA
LIFE HISTORY
get experience across materials
Professional History
Traditional
Modern
Opps to teach across material
Maths
Sc
Tx
Comm
FM
Graphics
Eng
Library
OCR
External courses
TWO SCHOOL EXPERIENCES
Pupils Love "interconnecting rooms"
"small rooms"
Food
Sharing skills
CPD from Colleagues
OLD
TEACHING EXPERIENCE
Sharing prof. dev. across dept.
"blended mum"
one computer room
Tech
Technician
TECHNOLOGY FACULTY
CHANGE IN JOB
Process Leader
BEFORE
NOW
Subject Leader (ENGINEERING)
LEAD ENGINEERING TEACHER "FORMAL"
MTWTHF
Weekly Team meetings
Projects
Team Planning
lots of crossover
"flexible"
Coding
Electronics
Flexible Tasks
GOALS
Interconnected Rooms
half yr Food
half yr Eng
Longer with 1 teacher in one area based on pupil choice
CHARLIE
Pupils knowledge
L3 basics of theory
Aspire to HoD
Not afraid of Modernisation
Influence Apprenticeships
Dev. Eng.
Improve Eng. Garden
Set fire
Big strength of school
Innovative
important to teach all classes; learn about pupils
Wants experience in Food
Apartment
School
Home
Other
Practical
pupils pick Engineering for future job
Lads - leave Shift
Hill last minute
VALUES
Paraphrase
Heard EBSS Team
College + Industry Needs
Work Projects
ROTATION
3 YR KS3
Ed
El
Gr
RM
En
SIL
KEY STAGE 3
BELIEFS
Funding issues
IDEAS!
One teacher???
"Stick in the group"
Teach to Sow
CULTURE
Traditional
High Grades
discussed with team
Your Project
"Taster"
Rotations
"getting people on board"
"drop feed"
Traditional Projects
Engineering
Time to prep
On the front line
DISCOMFORT
"pop it in" "fire it in"
Challenge
record home
drop feed
"feed in coursework"
Flexible
"You sort out Engineering"
Ownership
"Exactly the same"
Tech
Design
Textiles
Food
Art
Resistant Materials
Graphics
Drama
Music
Maths
Sc
Tx
Comm
FM
Graphics
Eng
Library
Charlie

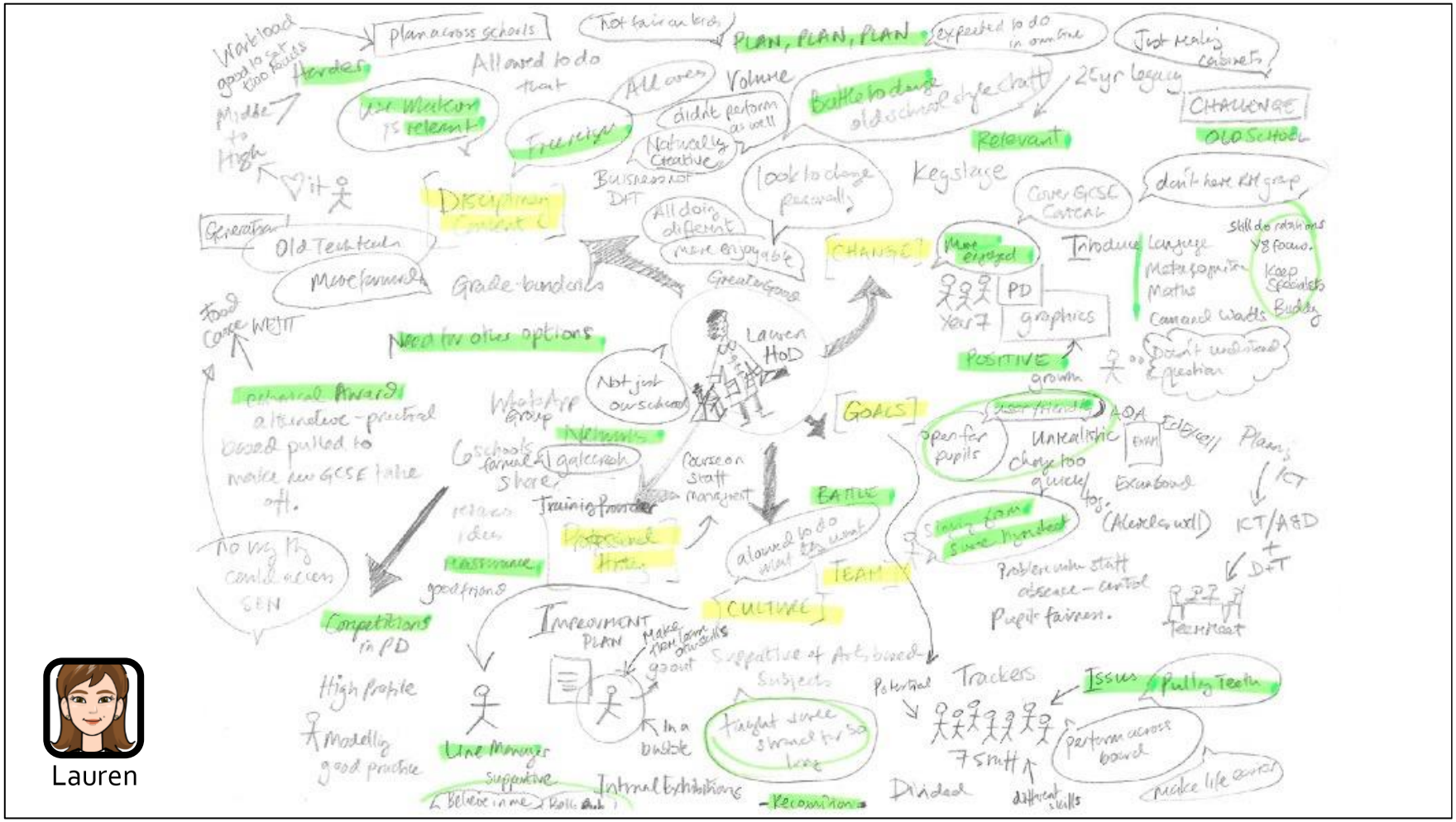

Deborah
Machining not hand tools
PR
RM
Electronics
Graphics
Mercedes
Shifted away from paper electronics
Mindbit
Alevel OLD Textbooks
Economics Vocational
PG Online Resources
curriculum
MIXED CULT.
Skills + knowledge
Bought in experiments
2016-2017
Struggled with part staff Rolled Old stuff carried
DISCRETIONARY CURRICULUM
Recycling
CHANGE
PRACTICAL + THEORY
Deborah
so much in new GCSE
Workshop Space
non-practical
Rotation for Fd/Tx
Half Year
Pedagogy
Pace
Pupils Engaged
Assessment
RM
El
Gr
Fd
Tx
Product Design
Project
Project - you know who's owns it
Your RESPONSIBLE
TEAM
Professional Hours
Attend Courses
Lotsof knowledge
No work rooms
PLANNING DAYS
Fractions
New
Old
CULTURE
left to get on with it
New Staff
Mapping Curr.
Visit other Schools
Joined up
Chunked
Job manages itself
Pressure from School
SLT
Tick boxing
SOW Protocol
Work 4 times
Pupils
Ways of doing it
To be taught the screen
Random things
Training PD
Textiles
Food
Low high
at GCSE
Knowledge
1x AS Level
Up our game
Building Build for staff to work in cells + classrooms
Committed Approach
Thinks done rated now
following design process
Outline of practical work
ASA
KS5
KS4
KS3
Part way
End product
Term 1/2
Works really well
Skills
Knowledge of Sustainable Design
Assessment separate to classwork
Influenced by GCSE
One Assessment each half term
Planning + feedback Policy
Days to wks
On...
On Trello
In book
Year 9 Options
Pupils choose Specialism in Y8
CONTINUATION
GCSE Questions
Terminology
Bought to KS3
Influences everything
Getting Good avg from DT
Carrot cutting
GCSE
No Drama
No Alevel
Skill Judgement
TOP DOWN PLAN
BNF Guidelines influence KS3
Struggling to see where lessons fit in
Food
Google Sketch Up
2D Design
Charged Scores
FOOD

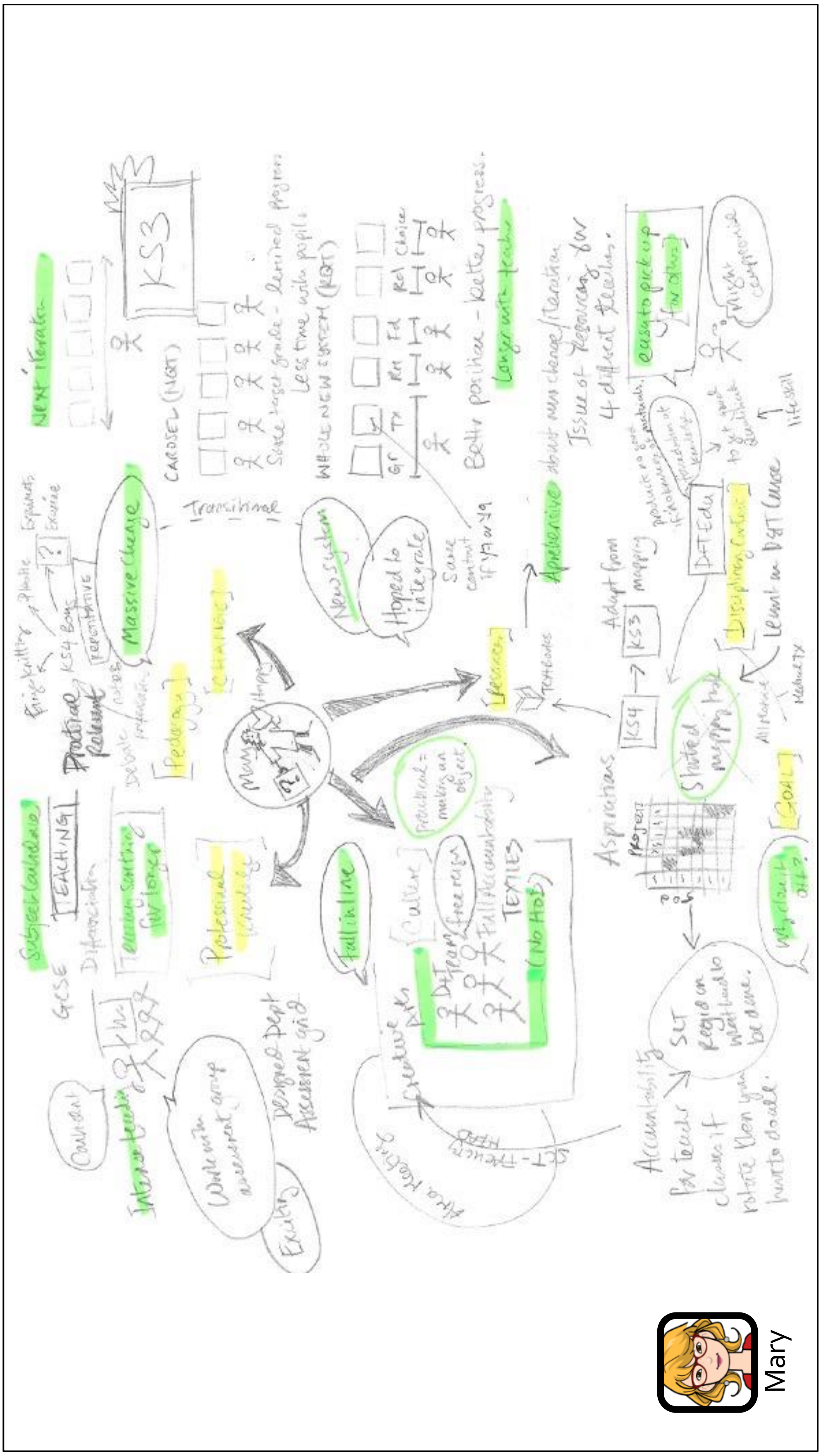


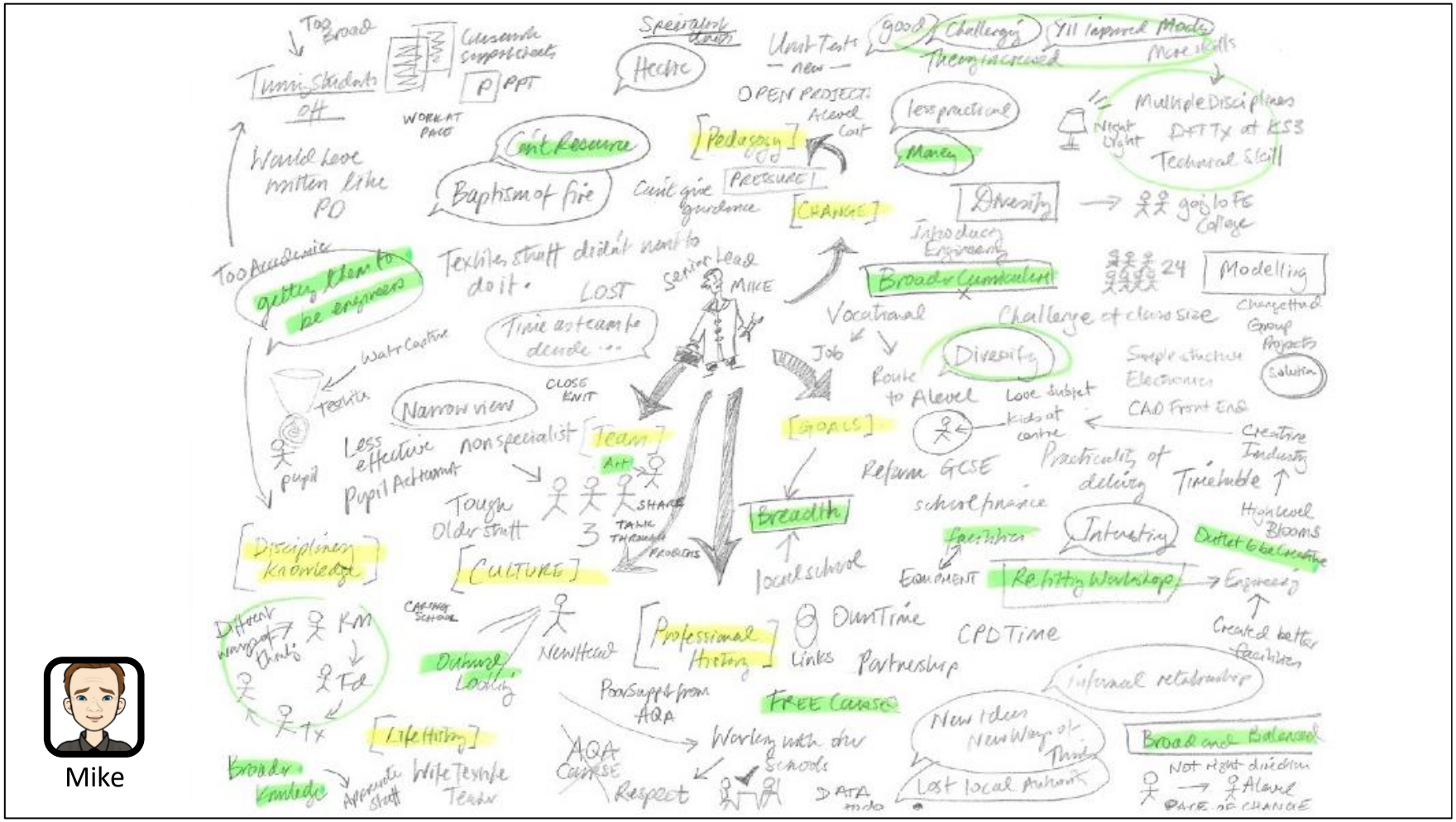
Hetain
Y10 Textiles Specialism
Core Knowledge
Y11 Contextual Challenge
TECHNICAL AWARDS
CULTURE
FREEDOM
CURRICULUM
CHANGE
Pedagogy
Confidence
Professional History
Learning with the job
Culture
Team
GOALS
1st YEAR
Creativity compromised
Fortunate
Specialist
Textiles
Science
Pupil Choice
AQA Course
Bought in Resources
Unit Tests


Judith
Timber (Engineering)
Specialist
Textile
Edexcel
- Cast Cutting
- Laser cutter
DK knowledge
ENGINEERING Exam
Differentiate
Talk through with pupils
Pedagogy
Resources
Pupils
2 making Products out of Wood
Tex Questions
Taught other teachers
Skills
Not job making
Problem to solve
H+S Accreditation
Outstanding Teacher Training
Attend Exam Board
Talked At
Assembly about jobs in Engineering
Bit overlap
Lots given info
Disciplinary Content
Ergonomics
Statistics
Figures
Keep with group
Help track progress
Keep pupils for two year
Curriculum
CHANGE
Has been hard
DETSHIFT
3yr KS4
up for doing it here
Mini-training
Coming off circus
12 weeks
Poly | Metal | Tx | Fd | Tim | Eng
12 wks
Same Team
Skills DEV
Materials Research
Than choose material
Time Piece (not Clock)
Pressure of GCSE
FPT - Mime joint
tourniquet
Small products FPT
feel creative here
research before picking up materials
if you want department to be successful
Be Flexible
Break attitude
GOAL
lots of jobs
Keeps you in your job
Design or Food CONFIDENT
BREXIT (Engineer)
Meeting = Time for Training
All Design Team
Team
Constant Training
Weekly Team Meeting
Creative Team
Solve Problem together
Formal Train
Sat around and decided
SMALL DEPARTMENT
VALUED
HSD
Culture
Department will handle
Teaching School
Everyone Valued
Students ignore early (20 min)
Engineering all in one room
Textile issue
Can move through carousel
Real Design
Presented with problem not solution
Design in workplace
Everyday problems
Routine
Able to open a group
Share Findings
Specialist content
Specialist designers
Teacher non-specialists
Formal / informal
Share to Secondary Schools

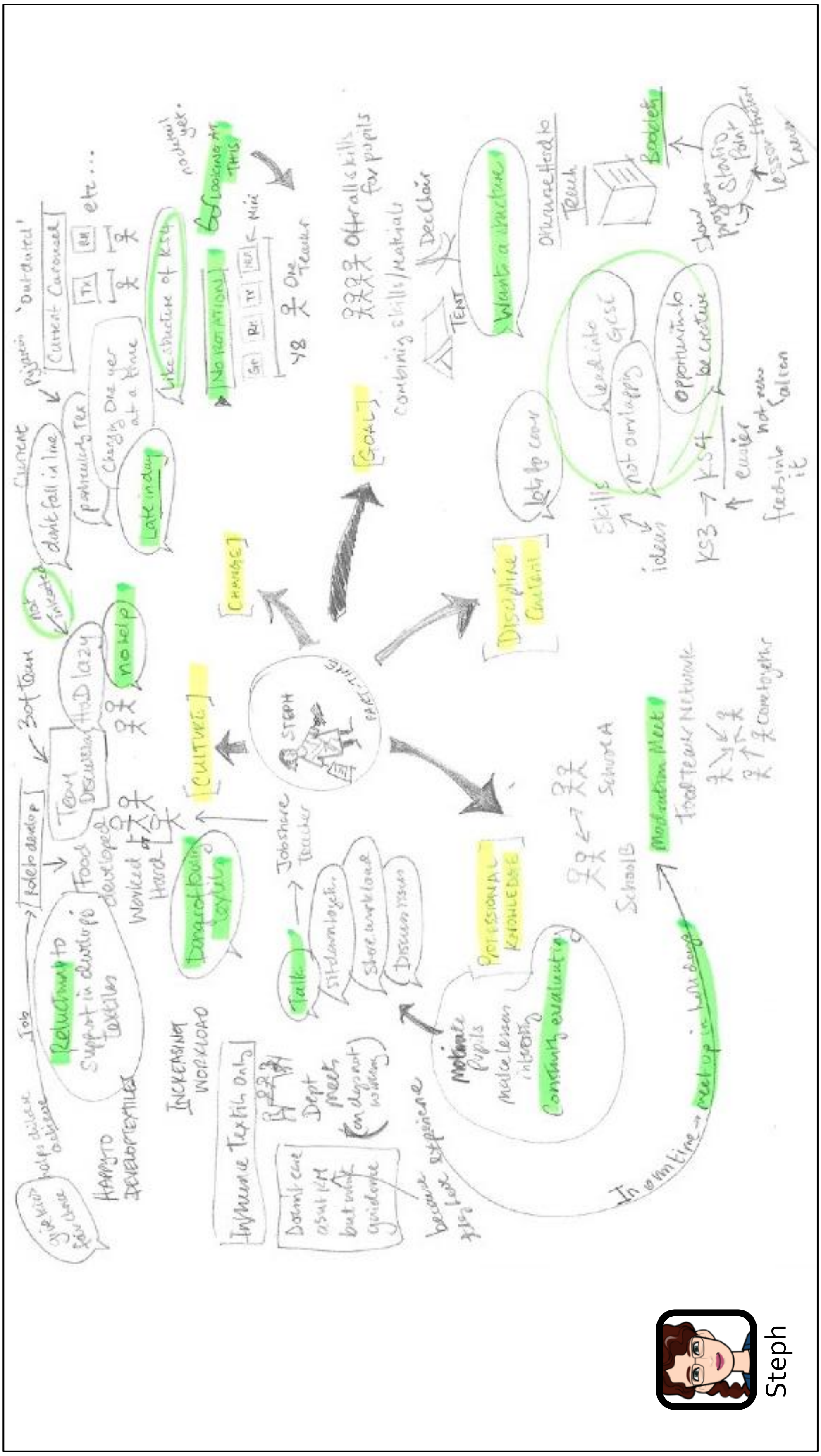

Kerry


Lauren
Lauren HoD
PLAN, PLAN, PLAN
Plan across schools
Workload good to set too hard
Harder
Middle to High
Allowed to do that
Not fair on kids
Expected to do in our time
Just making cabinets
CHALLENGE
OLD SCHOOL
Relevant
25yr legacy
Battle to change old school style staff
Didn't perform as well
Naturally Creative
All over
Exercise
Volume
Business not DHT
Discipline
Consistency
Look to change massively
Keystage
Cover GCSE Content
don't have KS1 grasp
Still do relationships
Y8 focus.
Keep Specialists
Buddy
Introduce
Language
Metacognition
Maths
Carousel
Walls
Old Textbooks
More formulaic
Grade boundaries
All doing different
more enjoyable
Greater focus
CHANGE
More engaged
PD
Year 7
graphics
POSITIVE
growth
Don't understand
Question
Need for other options
Not just our school
WhatsApp group
Intervents
Courses on staff management
Training Provider
Professional Hubs
GOALS
BATTLE
TEAM
CULTURE
Unrealistic
Change too quickly
Exam board
(Alexelcurll)
ICT
ICT/A&D
+
D&T
Teamwork
Problem with staff absence - control
Pupil fairness
Trackers
Issues
Pulling Teeth
Potential
7 staff
different skills
Divided
perform across board
make life easier
Improvement Plan
Make non-formal observations about
Supportive of Art based Subjects
Fright since should try so hard
In a bubble
Internal Exhibitions
Recognition
Line Managers
Supportive
Believe in me
Modelling good practice
High Profile
Competitions in PD
Improvements
Reasonable good options
Share
Galleries
Courses
Informal Rewards
alternative - practical based pulled to make new GCSE take off.
No way PD could access SEN
Food Core WETT
Great Team
Old Textbooks
More formulaic
Open for pupils


Next iteration
KS3
CAROSEL (HOT)
WHOLE NEW SYSTEM (ROT)
Better positive - better progress.
Longer with teacher
Apprehensive
Issue of reporting b/w 4 different teachers.
Massive change
Transitional
New system
Hoped to integrate
TEACHING
GCSE
Current
Pedagogy
Professional knowledge
Designed Dept Assessment grid
Fall in line
Culture
Creative arts
TEXTILES
(NO HOT)
Mary
KS4
KS3
Adapt from mapping
Aspirations
Shifted mapping
GOAL
Accountability
Mary

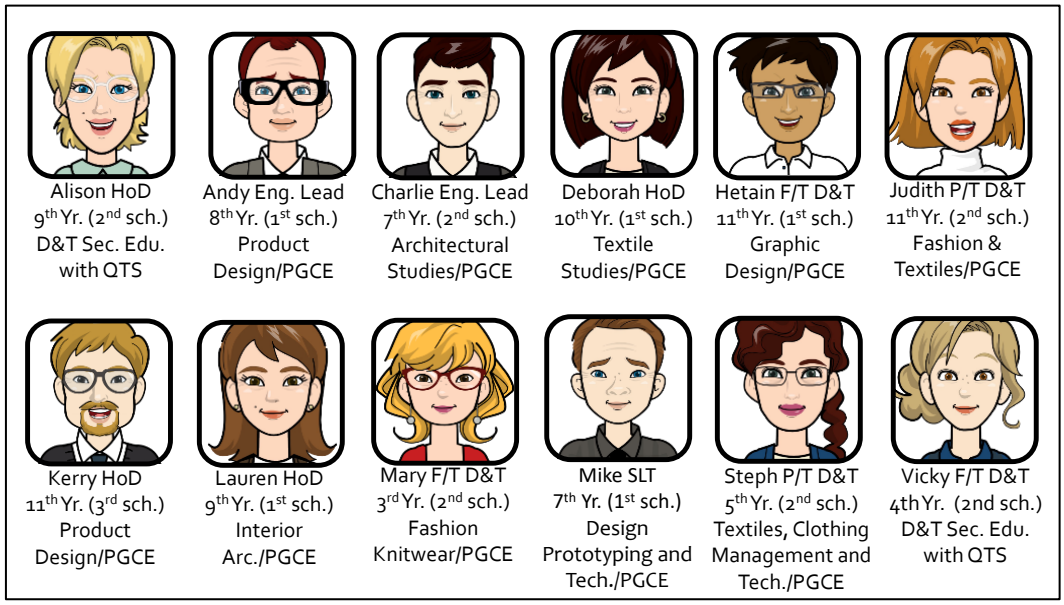

Too broad
Turn students off
Classwork
Homework
PPT
WORK AT PACE
Would have written like PD
Too Academic
getting them to be engineers
Textiles stuff didn't want to do it.
LOST
Time as team to decide ...
Water Centre
Textile
pupil
Narrow views
CLOSE KNIT
Less effective
Pupil Achievement
non specialist
Team
Tough Older staff
3
SHARE
TAKE THROUGH PROCESS
[CULTURE]
[Disciplinary knowledge]
Different
KM
Ed
Tx
CASTING SCHOOL
Natural Leading
NewHead
[Professional Hiring]
Links
OwnTime
CPDTime
Partnership
Poor Support from AQA
AQA Course
Working with other Schools
Respect
DATA
[Life History]
Broader knowledge
Apprentice staff
Wife Textile Teacher
Specialist teach
Unit Tests — new —
Hectic
OPEN PROJECT: A level Coursework
[Pedagogy]
Cont Resource
Baptism of fire
Can't give guidance
PRESSURE
[CHANGE]
good
Challenging
Y11 Improved Mocks
More skills
Theory increased
less practical
Money
Night Light
Multiple Disciplines
DT Tx at KS3
Technical Skill
Diversity
go to FE College
Introduce Engineers
Broader Curriculum
Vocational
Job
Route to A level
Challenge of class size
24
Modelling
Diversify
Simple structure
Electronics
CAD Front End
Creative Industry
Love subject
kids at centre
[GOALS]
Reform GCSE
Practicality of delivery
Timetable
High level Blooms
Outlet to be Creative
Breadth
school pressure
Facilities
Equipment
Industry
Refitting Workshop
Engineering
Created better facilities
local school
Informal relationships
FREE Courses
New Ideas New Ways of Thinking
Lost local Industry
Broad and Balanced
Not right direction
A level
RATE OF CHANGE

Mike


STEPH
CULTURE
CHANGES
GOAL
Discipline Content
PROFESSIONAL KNOWLEDGE
Moderation Meet
INCREASING WORKLOAD
Steph


Vicky
Mainly Manufacturing Spec
Stabbing in desk
Sustainability
Practical
Not taught enough about design
Material knowledge
Y10
THEORY
SPECIALISM
[Disciplinary content]
[curriculum]
Teach same content
Yr9 core
CORE
Less
Filter it down
Taster of each
topic skills
Rotation — All on timetable at same time
wider picture
More recession
individual
[Pedagogy]
[CHANGE]
different materials
Old School
Temporary Cutout
Exercise title
[Life History]
[Professional History]
Results!
Vicky
[GOAL]
Specialist
versus
Small class sizes
Some non specialist
Not best
Mainstream 3yrs teaching old style D+T
Friendly
[CULTURE]
we're trained
don't have option choice on teaches
pull together
BIG REPAIR
[Disciplinary content]
graphics
LESS DESIGN WORK
[TEAM]
SOH
Needed
Pull together
Planning
specialists
OFFERED HELP TO PLAN
non-specialists
he teaches it
Learn about different materials
Missing - key terms
ALL PRODUCTS ALL MATERIALS
FEAR OF MAKING AN ERROR
Life skills versus Being a designer
EXAM BOARD
OUTSIDE SCHOOL
Vicky
HOD
Together
Start from scratch
Skewer when we want
Planned lesson
Mapped old to new.
non-specialists
CPD Slot
Prefer existing Spec
X Crowd Funding
OLD → NEW
like the student
EL
Plastic
Wood
Student
TEACHER
+
-

Appendix 16 Visual toolkit



Alison example

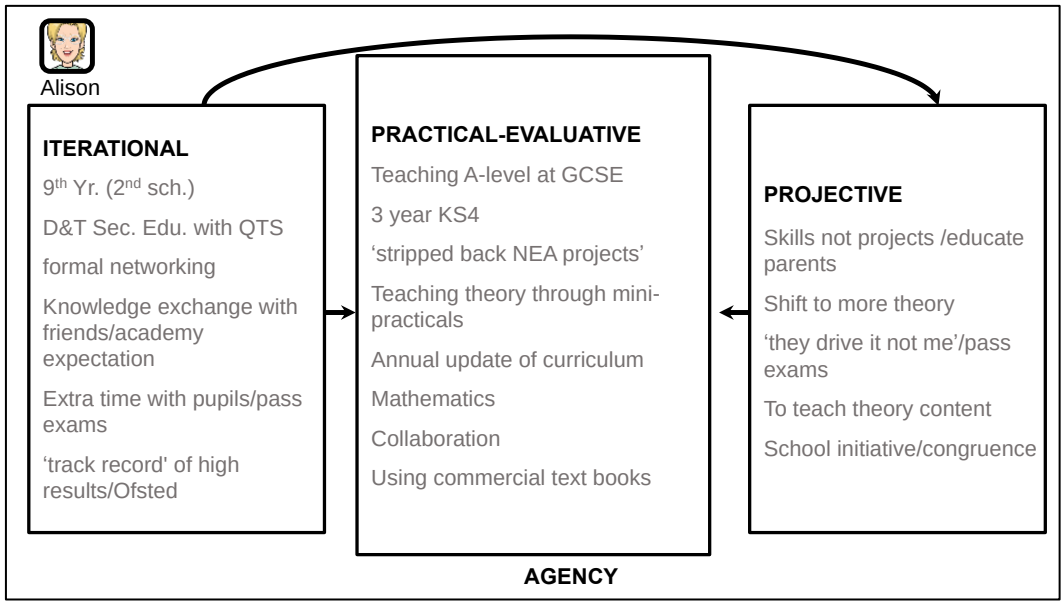

Alison HoD
9th Yr. (2nd sch.)

- **At the time of the interview:** Alison (female) worked in a sizeable MAT secondary school in the East Midlands. She had been teaching for nine years, and this was her second school since graduating with a BA (Hons) in Secondary design and technology education with QTS.
- Alison had just completed a one-year secondment to SLT, she was the subject lead for design and technology in a dept. of two teachers – she had sole responsibility for KS4.

Demographic and contextual information.

	Practice Focus Practical- evaluative dimension of agency	**Frame of reference** Iterative/Projective dimension of agency
 Alison HoD 9th Yr. (2nd sch.)	Teaching A-level at GCSE	Shift to more theory
	3 year KS4	Extra time with pupils/pass exams
	‘stripped back NEA projects’	‘they drive it not me’/pass exams
	Teaching theory through mini-practicals	Skills not projects /educate parents
	Using commercial textbooks	To teach theory content
	Annual update of curriculum	‘track record' of high results/Ofsted
	Mathematics	School initiative/congruence
	Collaboration	Knowledge exchange with friends/academy expectation

A summary of the issues and challenges faced.



A model of the design and technology teachers’ achievement of agency.