One teacher's experience of the need to teach outside their specialist material area.

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Abstract

Policy changes in England, have shifted the subject focus. Previous policy advocated knowledge and skills bounded by specific practices in an individual material area (for example, Textiles). Whereas the new policy shifts teaching towards a single-subject. A subject that requires pupils to learn across material areas and answer contextual problems through a breadth of material specialism expertise. For teachers, this means that they can no longer work within one specialist material area, and therefore they need to find ways to respond to the change and teach more broadly.

The research reported here explored how one teacher delt with this change by identifying the resources used to translate the new policy into practice. This research was part of a professional doctorate project. Qualitative data were collected during the first year of the new policy examination. Semi-structured interviews explored the teacher's experience, specifically the individual and structural resources that supported new modes of practice. Interview transcripts were first analysed, and a rich picture was developed to describe the teacher's response to change, finally data were coded thematically to develop a model of D&T teacher agency.

The findings suggest that both individual and departmental factors influence how this teacher managed the shift to single-subject teaching. For example, the teacher's past experiences and conceptions influenced their capacity to teach outside a material specialism in the present school setting. In addition, the learning opportunities afforded by this teacher's context were key to subject integration and the break with established practices that perpetuate the tradition of individual material area boundaries.

This research will enhance understanding of D&T teachers' strategies in response to shifts in subject focus. In addition, how past, present, and future agency impacts teacher responses to change. There is a profound need to recognise the breadth of subject knowledge and skill required to teach outside a material specialism and the need for teacher preparation programs to develop student teachers' expertise around identify the resources needed for good D&T practice.

Key Words: teacher preparation, subject specialism, teacher knowledge and understanding, teacher agency.

1 INTRODUCTION

English policy developments in 2014 led to seismic curriculum changes for teachers and teaching in Design and Technology (D&T). The changes arose from a review of the National Curriculum in England that aimed to compete with other high performing curricula internationally (Department for Education, (DfE), 2010). Although the review proposed greater professional freedom over curriculum organisation, the subject emphasis for D&T shifted away from specialist material and making towards core technical and design knowledge (DfE, 2013). Lower-secondary (11 – 14 yr. old) pupils were expected to study content that would enable them to progress successfully to the new General Certificate of Education (GCSE) qualification in either D&T (DfE, 2015a) or Food Preparation and Nutrition (DfE, 2015b). The new D&T qualification stopped offering a range of qualifications (under the heading of

D&T) for pupils (and their teachers) to choose from, instead, the new GCSE aimed to develop both core and specialist knowledge and understanding through a single-subject. This new qualification would assess pupil knowledge across all the material areas associated with the previous examination system (Electronics, Product Design (PD), Graphics, Resistant Materials (RM), Textiles, Systems and Control (S&C)). In addition, the new GCSE required pupils to understand and apply an iterative process, by exploring, creating, and evaluating a range of outcomes.

Subject teachers were expected to redesign the lower-secondary curriculum from September 2014 onwards in preparation for the first teaching of the new upper-secondary examination in 2017 (Choulerton, 2015). The move to a single-subject meant that teachers would need expertise across the range of material areas that pupils might specialise in at the examination stage and separating lower-secondary lessons to reflect the previous examination options, for example, Graphics, and Textiles would be less appropriate. However, the review and following policy papers were unclear about how teachers would be supported in this endeavour.

The research reported here is part of a larger professional doctorate project. The project was a qualitative investigation of the ways that D&T teachers, who completed their initial teacher education with one university provider, translated the policy development into practice. My interest in this research topic stemmed from my work in D&T teacher education. As a reflective practitioner, I was aware of the need to adapt teaching to support my student teachers with working through the changes, and I was frustrated that student placements lacked coherence in relation to the experiences offered. The support for development of student teacher expertise outside a teacher's background and material qualification were lacking. The research reported here focuses on the findings (from the larger project) that relate to specific issues and challenges that one teacher (Judith) faced because of translating policy developments into practice.

2 LITERATURE REVIEW

In England, D&T lessons are typically taught through a rotation system (also called a circus or carousel) of material specialism modules. Teaching through a rotation system characteristically involves lower-secondary pupils moving three to four times a year from one material specialism module and teacher to another (Ofsted, 2008; Ofsted, 2011). This system allows technology teachers to plan and teach lessons focused on their specialist area/s of material expertise. The system was first used at the start of the subject's history within the National Curriculum. Back then Penfold (1988) observed that the system was developed to bring teachers of home economics and craft together in a way that was an affordable solution to teaching all pupils all material specialism modules within one subject.

With a rotation system of delivery pupils move from one material area to another, and in the process, they are passed from one classroom teacher to another. The passing of pupils from one teacher to another has been repeatedly recognised as creating issues for continuity and progression (Choulerton, 2016; Ofsted, 2008; Ofsted, 2011). Issues that have led to criticisms about the level of repetition that pupils' experience beyond a change in the use of materials (Hardy, 2020). Even when the move from one material area to another is reduced, for example, when the pupils stay with one teacher for RM, S&C, and another for Food and Textiles (Ofsted, 2008) continuity can be lost. Key information about the pupils' progression within the subject must be shared with the following teacher to ensure adequate 'transition and transfer' (Pollard et al., 2019, p. 456) that goes beyond the sharing of assessment information (The Sutton Trust, 2011). When this happens, the rotation system can successfully support better pupil progress (Ofsted, 2008).

The number of rotations a pupil experiences at school may also depend on the different types of knowledge teachers feel they need to deliver through D&T lessons. Bell at al. (2017) conducted research into the specialist knowledge that teachers taught, in school. They identified a variety of disciplines that encompassed the current subject in schools, including Computer Aided Manufacture (CAM), Computer Aided Design (CAD), Technological Textiles, S&C, Engineering, Electronics, Food Technology, RM, Product Design (PD), Apparel Textiles and Graphic Design (Bell, 2015).

Table 1. Previous material specialisms in the English D&T curriculum for lower-secondary.

Department for Education and Science (1989)	Department for Education (1995)	Department for Education and Employment (1999)	Qualifications and Curriculum Authority (2007)
Natural and manufactured materials	Resistant material	Contrasting materials including resistant materials, compliant materials and/or food.	The curriculum should include resistant materials, S&C and at least one of food or textile product areas.
	Compliant materials and/or food	Common and modern materials	Smart materials
	Control systems	Control systems	Electrical, electronic, mechanical, microprocessors and computer control systems
		Electrical, electronic, and pneumatic systems	
		Systems (not specifically electronic)	CAD/CAM

A reason for the expansive list of disciplines that teachers perceive the subject to encompass may be related to the range of material areas that the subject has been associated with historically (see Table 1). Which the current curriculum removed and replaced at lower-secondary with a shift to local and industrial contexts, that do not favour a specific material area. However, the contexts might for example, include the home, health, leisure and culture, engineering, manufacturing, construction, food, energy, agriculture, and fashion (DfE, 2013). In addition, greater clarity around the technical knowledge prescribed at upper-secondary (14-16 yr. olds), including:

- papers and boards;
- natural and manufactured timber;
- ferrous and non-ferrous metals;
- thermoforming and thermosetting polymers;
- natural, synthetic, blended, and mixed fibres, and woven, non-woven and knitted textiles (DfE, 2015, p. 6).

It is not surprising that teachers might identify their expertise in relation to one material specialism. A specialism that relates to their first-degree, teacher preparation and competencies developed within the workplace. A survey, in 2017, of 379 secondary D&T teachers (Design and Technology Association, unpublished) identified the aspects of lower-secondary teaching those teachers felt they were able to teach with confidence, see Figure 1. The survey revealed that just over half of the teachers felt able to teach Food and PD (another word for RM and/or Graphic Products); 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 (Childs & McNicholl, 2007). Opportunities that might help D&T teachers with the challenge laid out by Choulerton (2016) to not see themselves as teachers of a specialism but teachers of D&T who need to teach more broadly.

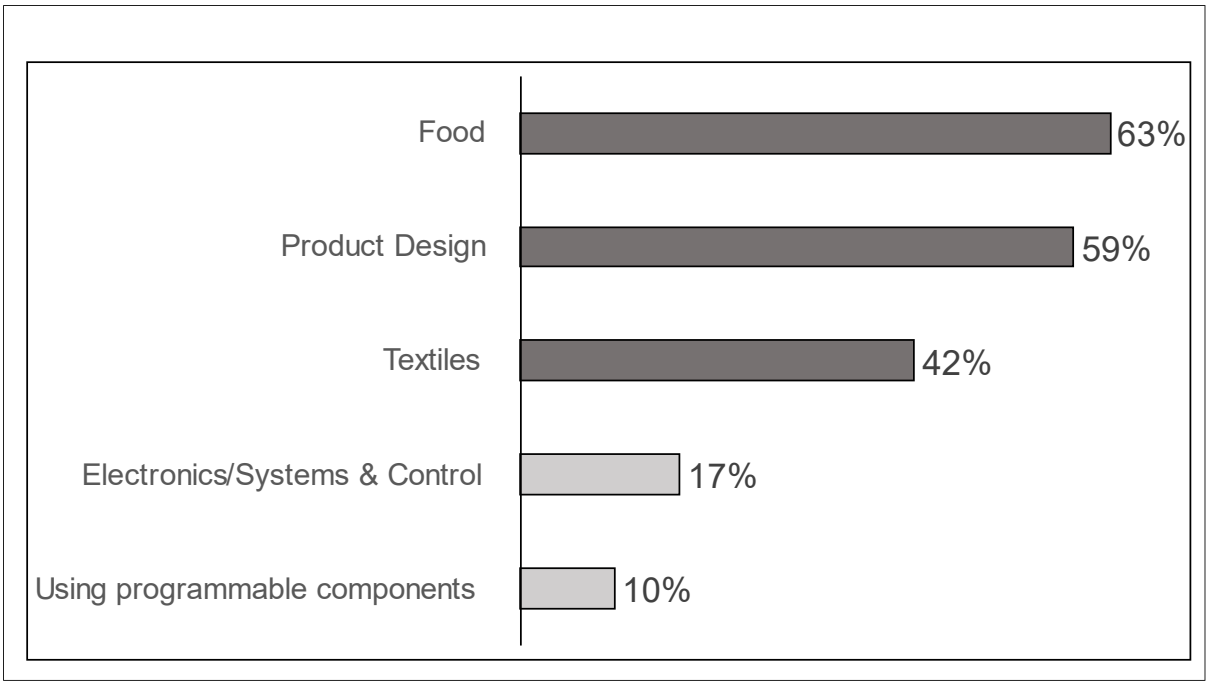

Figure 1: Aspects of KS3 D&T that teachers feel able to teach well (Design and Technology Association, unpublished).

However, a difficulty with teaching more broadly is the need to cross subject boundaries. Boundaries that Goodson (2013, p. 106) described as having their own set of 'practices and expectations' that form a subject sub-culture. Darby (2006, p. 56) builds on Goodson's work to conceptualise subject boundaries as the 'language, epistemology and traditions' that form a boundary around a subject. A boundary that governs practice in the subject through a shared aesthetic understanding of the subject sub-culture. A subject sub-culture that previous teachers of D&T have retreated from (Paechter, 1995), and which Bell et al. (2017, p. 547) explain as only being obtained through the presence of 'a shared axiomatic, epistemological integration' that can evolve a 'common subject identity'. In addition, Darby's (2006, p. 55 - 56) research suggests that crossing boundaries is progressive and only through the stages of 'understanding, unification and transformation' can a common identity be formed.

In summary, the subject has a history of separating knowledge by material focus. The separation of content by material focus has been reinforced through the practice of rotation and the individual teacher's identity as a specialist. However, the new policy requires teachers to embrace the breadth of the materials that belong to a technological world and become broad in their knowledge and expertise.

2.1 Conceptual framework

The study drew on the theory of agency to better understand the actions that teachers take in response to policy reform.

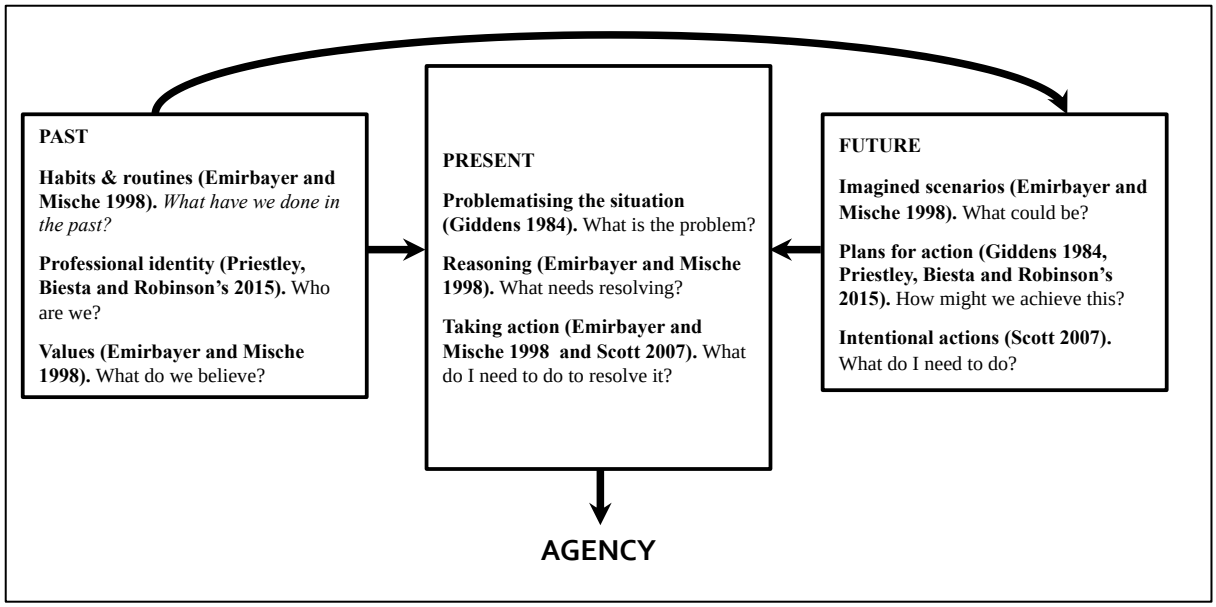

Figure 2: A framework for understanding a D&T teacher's achievement of agency derived from the literature.

Agency has been defined as the capacity of individuals to take intentional actions that shape their social environments (Giddens, 1984; Giddens, 1994; Priestley et al., 2015; Scott, 2007). I have also drawn on Emirbayer and Mische's (1998) theory, which offers a definition of agency as a human's capacity to act in time-related ways that influence the shape of their social world. Agency offers a theoretical lens to make sense of the actions that the teachers' accounts have given me (see Figure 2).

3 METHODOLOGY

The study adopted a qualitative approach towards research design (Creswell & Poth, 2018). The project planned to answer the following research questions:

- what are the specific issues and challenges that these D&T 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?

Participants were selected from a purposive multiple case sample (Cohen et al., 2011; Creswell & Poth, 2018; Robson & McCartan, 2016) and data were gathered through in-depth interviews (Foddy, 1994; Kvale, 1996) with 12 D&T teachers. All 12 teachers shared the characteristic of having completed their teacher preparation course with one (the researcher's) university-based provider. The choice of in-depth interview was adopted to allow the research participants to describe their experiences with maximum freedom (Robson & McCartan, 2016). In-depth interviews have been described as a conversation between two people (Creswell & Poth, 2018; Robson & McCartan, 2016; Silverman, 2015), leading me to a semi-structured format to guide and organise data across the different respondents (Cohen et al., 2011). Validity was achieved in a range of ways, including the collection of data within the participants' natural setting, researcher reflexivity, and the use of participant transcription checking. The study drew on a creative analysis approach (Kara, 2015) that combined soft systems methodology (Checkland & Poulter, 2006) and thematic analysis (Gibbs, 2018; Saldaña, 2013) to interpret the data, which led to sets of individual teacher profiles and achievement of teacher agency models. The choice of a qualitative approach generated subjective knowledge and experiences that although, not universal offered individual truths about insights into the problem of translating policy developments into practice. For ethical reasons, the real names of participants have not been used.

This paper reports on one participant – Judith (a pseudonym so that the narrative is personal and easier to read). The following section presents Judith's individual teacher profile, which incorporates

demographic information, a visualisation of Judith's interview and a textural description of her experience. The section analyses the findings using the framework for understanding a D&T teacher's achievement of agency derived from the literature (see Figure 2). Judith's past, present and future actions are first described and then analysed to provide an understanding of her individual achievement of agency (see Figure 3). Direct quotes from Judith are included where "speech marks" have been used, for example, "coming off the circus".

4 JUDITH'S PROFILE

At the time of the interview Judith (female) worked in a high-performing (11-18 yr. old) Academy Trust school. Judith was in her 11th year of teaching at her second school after graduating with a Post Graduate Certificate in Education. She had a background in the fashion industry and a degree qualification in Fashion and Textiles. Judith was keen to develop professionally and had registered to complete a lead teaching qualification. She taught upper-secondary D&T alongside Food Preparation and Nutrition. Judith's account of translating policy reform into practice was framed by her context of working within a small teaching team that she described as a group of "active teachers". The main issues and challenges that Judith faced in relation to the policy development related to the shift to teaching more broadly, teaching through contexts and opportunities to share expertise.

4.1 Past Agency

Judith's account of teaching the new policy was influenced by her experience of teaching more broadly at her previous school, which she called "coming off the circus". She was competent in teaching material specialisms beyond her first-degree in fashion and textiles, and she persuaded her head of department to trial the approach in her current school. Judith and her team decided to "keep the pupils for the year" and deliver a curriculum of six-week modules that covered topics on polymers, pewter casting, textiles, food, timbers and ended with an engineering project (that ran for 12 weeks). Judith justified the move to teaching across specialisms a way to "track the [pupil] progress". She also identified that "everyone in my class is taking D&T at GCSE" which she related to that fact she taught the same group of pupils over two years.

Judith's description of her past agency in relation to teaching outside her specialism reveals an intention to continue to teach a broad curriculum despite moving schools (Choulerton, 2016; DfE, 2015). An action that supports Bell et al's, (2017) claim that D&T teachers recognise the range of disciplines within the subject, whilst recognising the need to support pupil transition (Pollard et al., 2019). Judith's description of remaining with the same pupils throughout the school year supports the continuation of knowledge of learners beyond assessment data (Sutton, 2000), However, the pupils still move from one specialist module to another, which may suggest some level of repetition (Hardy, 2020).

4.2 Present Agency

Judith's description of the different ways that she develops her own (and others) competence in other material specialisms evidences her achievement of agency in the present. She described how the shift to single-subject teaching meant that other teachers in the department, along with herself, "wanted to be flexible and be trained in all these different areas". To do this, Judith talked about how the "specialist teacher", within the team, designs the curriculum content for their specialism and then shares the resources with colleagues and delivers training events, both formal and informal. As a team the decision was made to use one of the "two staff [weekly team] meetings" to share expertise and exchange knowledge and skills. This led to a culture of "constantly training", which Judith attributed to the head of department, who made "everyone [feel] valued". She also explained how her school finished lessons early on the team meeting afternoon, so staff were able to use part of the school (official) day for planning.

Judith' account of the shift to teaching more broadly shows how the problem of teacher confidence in material specialism expertise (Design and Technology Association, unpublished) can be resolved

through opportunities for collaboration. Opportunities that encourage teacher learning in the workplace (Childs & McNicholl, 2007). Judith's desire to both share and develop her expertise, is used to cross subject boundaries (Goodson, 2013) in the present. Her fellow teachers' willingness to embrace the shift to broader expertise starts the process of cross subject understanding that can build a shared subject identity (Bell et al., 2017; Choulerton, 2016; Darby, 2006).

4.3 Future Agency

Judith's account painted a picture the way she imagined the subject could be when she talked about "breaking [traditional] attitudes" towards D&T in her learners. She wanted her pupils to see the subject as one, because she felt that "students need to be product designers". She explained that product designers need to be taught "that there's a problem to solve". In addition, she described how the department team were preparing to teach a module called Engineering, during the last term of the lower-secondary 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 would be "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".

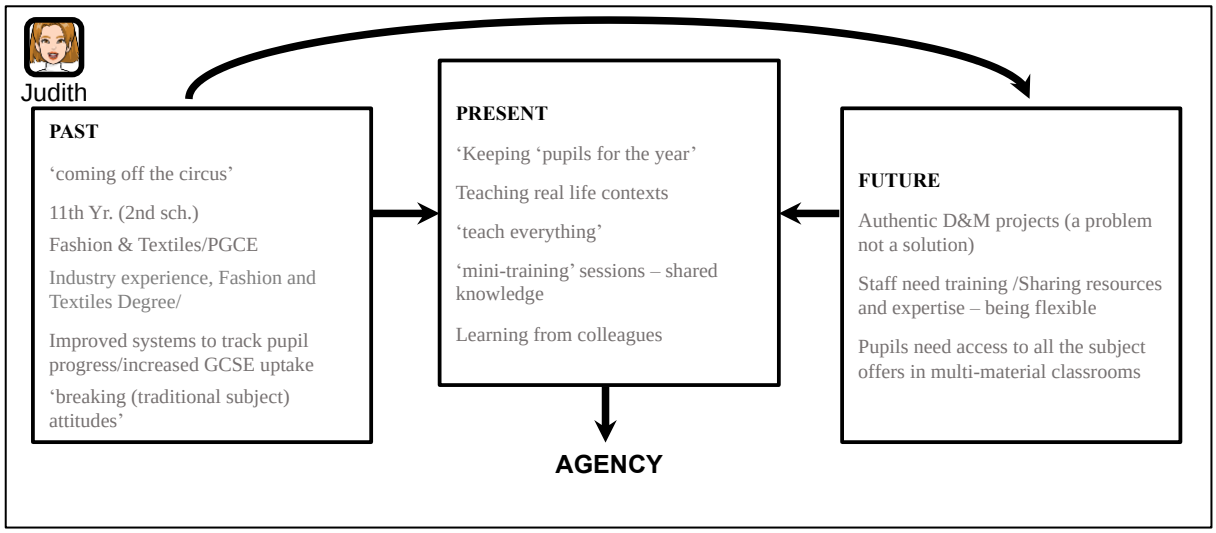

Figure 3: A model of Judith's achievement of agency.

Judith's account suggests that her disposition towards a broader curriculum is based on her experience of different work environments, for example her pre-teaching career in industry and previous school. An experience that she uses to make sense of the curriculum development and her plans for future practise. The plan to include a module called Engineering and focus on learning across materials through a real-world problem suggests a link to the types of local and industrial contexts being encouraged through the new policy (DfE, 2013; DfE, 2015). Her view of a multi-disciplinary environment for teaching pupils about D&T implies a response to Choulerton's (2016) call for D&T teachers to view themselves in broad terms. However, the challenge for multi-disciplinary teaching spaces might pose risks to the original reason for a rotation system that Penfold warned was linked to making the subject affordable (Penfold, 1988).

In conclusion Judith's account offers an individual experience of D&T teacher achievement of agency within the context of a policy change. Judith's individual profile and achievement of agency model (see Figure 3) identifies the individual and structural resources that influence her response to teaching more broadly. These resources incorporate her past experiences across industry and previous schools, alongside a desire to change attitudes about what the subject ought to be, and her current practice of sharing expertise to support single-subject aims. Judith's description offers an insight into the ways that past, present, and future teacher agency create norms that align with single-subject policy aims. The strategies that Judith adopts in response to shifts in subject focus contribute to knowledge about the

resources needed to support subject change. The model of Judith's achievement of agency can be used in teacher preparation programs as a mechanism for student teachers' reflection about the resources needed for good D&T practice.

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