What's D&T For? Gathering and Comparing the Values of Design and Technology Academics and Trainee Teachers

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Abstract
Some who read and research about Design & Technology (D&T) would say that the concept of value is key to understanding and defining D&T. Closer inspection reveals though that there are two ways in which values are defined in D&T: how values are taught and learnt about in D&T to use them to make judgments in D&T lessons, and also how values are developed in pupils as a result of studying D&T. Layton's seminal keynote speech is the notable exception to these two classifications. In 1992 he shared a new perspective of values and D&T: how different stakeholders value the school subject D&T (1992a).

The work presented here builds on Layton's 'new' perspective and compares how two D&T stakeholder groups value D&T. The opinions of trainee D&T teachers and D&T academics, both directly affected by these changes were analysed using a grounded theory coded method. This resulted in a series of twenty-two values that facilitated comparison of the two group's values. Further analysis revealed there were many similarities between the two groups, and only a few differences. However these differences showed the trainees did not believe D&T can be about the process of designing or identifying the needs of others, both values central to the original purpose of D&T in England and recognised by the academics.

One implication for this, as schools take more ownership of teacher training, is that the value of D&T is likely to move further away from the D&T academics' influence and be based upon the 'spontaneous' (Dow 2014, p.151) values developed through classroom practice with little reference to external opinion.

Future work could widen the scope of the research, incorporating the values of other stakeholder groups into the values series and hence become a new tool to support the development of design and technology education, which hopefully will benefit others as they reflect on why they teach, research or use D&T.

Key words
value, design, technology, values, National Curriculum, stakeholders

Introduction
'Why do we teach design and technology?' seems a simple opening question to ask new trainee teachers, but it is less straightforward to answer. The changing nature of the subject as defined by national curricula, its subsequent interpretation by trainees and D&T teachers, and the espoused values in articles written by renowned D&T academics presents to the wider world a confused picture of the value of D&T (Hardy 2013, Wright 2008). Furthermore this process of clarifying, delivering and interpreting D&T is cyclical. New curriculum impacts on new classroom interpretations leading to new research, which has consequences – one of which maybe the cycle itself. A new curriculum proposal for D&T in English primary and secondary schools (Department of Education 2013a) revealed the confusion some people have about the purpose of D&T. As schools are now the primary leaders of teacher training in England this timely research compares how two stakeholder groups value D&T, aiming to provide some insight into why they have these values and the consequences of holding them.

There are five parts to this paper: context, method, method of analysis, results and discussion. Firstly the context discusses why this research is needed. The second section explains the method used to select the participants and how the data were collected. In the third section the method of analysis is explained in detail. As values are a subjective, qualitative phenomenon and how they have been mined from the data is central to the discussion the results are presented in two formats: ranking the values within the two participant groups and comparing the two group's values; their similarities and differences. The discussion section presents suggestions for why these similarities and differences exist and possible effects; it concludes with some thoughts on how the values series presented in this paper could be used by others and their limitations.

Context
Values and Design and Technology Education
In sociology and psychology the concept of value is measured and used to reveal how the interdependency of human values and attitudes impacts on behavior (Hiltin and Piliavin 2004). Within these two disciplines many base their understanding of a value on Rokeach's definition: "a value is an enduring belief,…a standard or criterion for guiding action, for maintaining and developing attitudes towards relevant objects and situations…." (1968, p.160). But in D&T the concept of 'value' has been primarily used in relation to subject content, pedagogy and outcomes:

- Layton identifies that there are different kinds of values that pupils need to learn about and be able to use when

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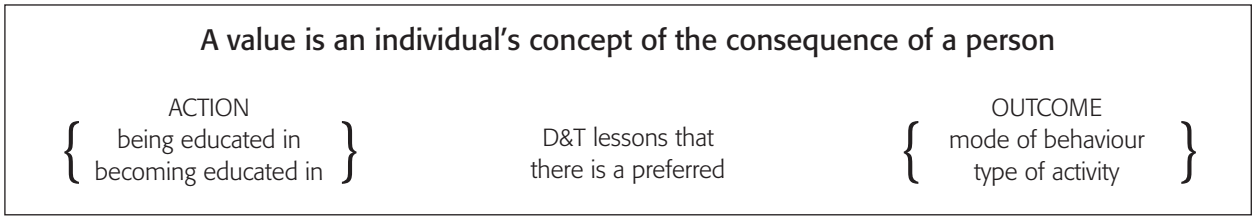

Figure 1. Mapping sentence to define a value of D&T

making judgments, such as technical values, economic values and moral values (1992b, p.36);
- Prime (1993) suggests there should be 'teaching and learning of values in technology education' because 'every new technology involves questions of ethics and values' (p.30);
- Trimingham (2008) demonstrates how internal and external values are used by pupils when making design decisions;
- Dakers (2005) argues that the 'formation [development] of values relating to the technologically mediated world we inhabit' (p.124) should be part of D&T education;
- Keirl asks trainee teachers (2007) whether developing pupils' ability to recognise the values within a technology and make value judgments about technology is part of D&T; he does answer these questions in other writing (2012, 2014);

Martin (1999) would probably define all of these uses as 'values within' D&T (p.202), but analysis reveals that they are either:

- Values in D&T: where pupils learn about values in D&T and use them in D&T activity (Layton 1992b, Prime 1993, Trimingham 2008) or
- Values developed through D&T: How a pupil becomes technologically literate as a consequence of studying D&T (Dakers 2005, Keirl 2007).

However Layton (1992a) recognised that there was an additional perspective to values in D&T:

> 'If some views on values and technology appear to you as the only possible ones, take this as a sign that you have neither understood the relationship of values and technology, nor the reason why an understanding of this is important.' (p.1)

Layton presents his new perspective not as values within D&T but how the values systems of stakeholders involved in the 'socio-political shaping of school technology' (p,3) influence design and technological activity. This brings us back full circle to the definition of a value stated earlier from Rokeach. However Rokeach's definition applies to the values human's hold and this paper is investigating the values humans have towards an object, which is the subject D&T; therefore the stipulative definition used here brings together these two aspects, a person's internal values and their values towards an object. Figure one shows the definition as a mapping sentence (Shye (1985) in Schwartz and Bilsky 1990) with two facets of value (action and outcome).

So this paper is looking for the values stakeholders have of D&T, whilst recognising that these values might be synonymous with the two types of values found within D&T.

The stakeholder's values could derive from their observation or perception of a person's behavior or activity (their own or someone else's) that results from learning D&T (now or in the past). The subject name D&T is used in this definition to encompass all previous subject names as some of the stakeholders could have been at school before the inception of D&T in the 1990 National Curriculum, or attended school in another country. Returning to the argument from Rokeach that by holding a particular value there are behaviors and attitudes that the holder of the value might have has merit in the two final contexts of this paper. Firstly the changing purpose of D&T as viewed by stakeholders since its inception in 1990 (Hardy 2013, Martin 2013, Wright 2008) and secondly the changes to the ownership of teacher training moving from universities to schools.

Historical development of D&T

D&T is a comparatively new subject in England, coming into being as a single subject in 1990 and drawing together diverse areas such as home economics, technical drawing, sewing, and craft, design and technology (CDT). Since the first National Curriculum in 1990 there have been four National Curriculum reviews in 1993, 1999, 2005 and 2012, resulting every time in changes to either content, assessment, or both.

Each review has led to a new curriculum (for a detailed timeline of these versions see Wakefield and Owen-

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Jackson 2013) and consequently those who are now involved in influencing and shaping the subject today could have experienced the curriculum in different ways. As a result of its history and subsequent changes, it can be hypothesized that stakeholders in D&T have different definitions of its identity and value, which may manifest as a lack of understanding between the different stakeholder groups.

Martin (2013) takes an autoethnographic approach to explore the 'history of the (D&T) curriculum [by] era…defining the essential characteristics/ feature of the time' (p.318). Martin's five eras are: making, personalising, designing, manufacturing and valuing. These eras are derived from the author's lived experience and it is beyond the scope of this paper to explore their accuracy in relation to other literature, but Martin provides an interesting starting point for the argument that the era a stakeholder experienced (was taught, learnt, trained teachers, was a D&T advisor, and so on) could influence their behavior and attitudes towards D&T and consequently their value of D&T.

Changes to teacher training

Changes to teacher training are significant because prior to 2011 Initial Teacher Training (ITT) partnerships were led by universities; government changes have transposed this partnership power as the preferred ITT model now is for schools to lead and run ITT with optional university involvement. Historically it has been university based teacher trainers and educators who have written, researched and informed changes to the curriculum but as more universities close their teacher training departments this expertise will diminish to the extent that they may be left with little power to influence how and why D&T is taught.

As D&T and ITT in England goes through more changes by understanding the values held about D&T by different stakeholders it may be possible to understand attitudes and behaviours towards the subject and any resulting conflicts similar to those revealed by the events of 2013.

Method

D&T Stakeholders: selecting the participants

In the context of this power shift and new curriculum this paper compares how stakeholder groups affected by these changes value D&T. There are many different stakeholders of education, each with different influences and roles to play in relation to the aims of education, curriculum and school subjects (Keirl 2007). Choosing which to compare involves selection based on stakeholder categorisation. The categorisation of different stakeholders has been discussed in business theory but rarely within education. One exception to this in D&T is the seminal work mentioned already from Layton (1992a), he identified five categories: economic functionalists, professional technologists, women and liberal educators. Whilst these groups still have relevance today, in the context of this paper their pertinence is not as strong as those who are involved in D&T education. Also his categories do not provide a simple method of comparison or classification of a wide number of stakeholders. Consequently a theory from business is used here to categorise stakeholders in education to determine whether and why they are relevant to this study. Following Mitchell, Agle and Wood's (1997) theory for identifying stakeholders, the definition of education stakeholders used here is determined as those who possess, or are attributed with possession of, one, two, or all three of the attributes: power, legitimacy, and urgency (derived from Mitchell, Agle and Wood p.872). The two stakeholder groups selected for comparison are trainee D&T teachers and D&T academics. They have different attributes providing one justification for comparing them as well as their aptness because of their contrasting perspectives on D&T, with one group at the start of their careers and the other established in their careers.

Of the three stakeholder attributes the academics have all three: power evidenced by representatives from this group being involved in the rewriting of the National Curriculum and also through their published work, urgency because if the subject is removed from the curriculum their positions in academia become untenable, which is demonstrated by closures of some university based teacher training for D&T, and legitimacy provided by their history and experience within the subject.

The trainee teachers have only weak legitimacy as novices in the teaching profession and subject but they do have power because of their future role in the classroom. Their power is immediate because of their potential to show how this subject is developed in schools They also have urgency because they need D&T to be taught in schools for them to have a purpose to their training.

Other studies have focused on stakeholders who are established D&T teachers or those close to the organisation of it, such as STEM teachers, principals, guidance counselors (Hamilton and Middleton 2002, Hill, Wicklein and Daugherty 1996), but those at the start of their D&T teaching careers and those who shape their training are rarely compared. How the values of new D&T teachers are shaped and changed has been debated (for example Dow 2014) and much has been written about the value of D&T (see: Barlex 2011, Keirl 2007, Wakefield and Owen-Jackson 2013), but a comparison of how these two groups value D&T has not been made before.

Data collection methods

To find the values the two groups held they articulated their opinion about what they believed the value of D&T was to pupils and society. The obvious limitations to this approach is the participants can choose to share only what they are willing to reveal; this was addressed by including more than one participant from each group as different people will hide and reveal different aspects of themselves.

The four academics were well established in their field with publications about D&T in international journals and books. Three were based in the UK, working at English universities and had taught on teacher training courses (but not the one attended by the trainees), the fourth was from Australasia. They were selected for interview based on their publishing profile, role in training D&T teachers and accessibility. Three of the academics were male and one female, all have been writing and working within technology education during most of the National Curriculum changes.

The thirteen trainees were studying at an English university, eight female trainees and five male; they were either in their final year of a three-year undergraduate teacher-training programme or on a one-year postgraduate programme, successful completion of which qualifies them to teach D&T in secondary schools.

All of the trainees, with one exception, attended secondary school after the introduction of the National Curriculum. The academics have been involved in D&T education, either as a teacher trainer, researcher or D&T teacher, during the same period.

Work published by all four academics was included as part of the programmes' reading list, which potentially influenced the values held by the trainees.

Data collection happened differently for the two groups. At the start of their course, after an introductory talk by the author, the trainees wrote a 1000-word rationale explaining their beliefs about why D&T belonged in the school curriculum. They were guided to literature, which was recommended by the author, to support their views; one academic participant wrote one of these recommended pieces, but the trainees' writing was primarily based on their own views and constructed from their reflections on my talk.

The academics were interviewed face to face; three were interviewed whilst at an international Technology Education conference, which may have influenced the values articulated in the interviews, and the fourth was interviewed at home. The interviews all lasted less than thirty minutes. Each interview began with an explanation of the research being conducted and asked each participant why they thought D&T should be taught in schools. Throughout the interview unplanned questions were asked and comments made which allowed for an exploration of the participants' views, encouraging them to elaborate on their narrative. The fluidity of this active interview method was considered to be appropriate as values of a personal nature and responses could not always be anticipated, therefore ruling out a more structured interview (Holstein and Gubrium 1995).

This was a pilot study exploring whether the values of stakeholders could be collected through using these two data collection methods.

Method of Analysis

The analysis method is based on a grounded theory coding technique from Auerbach and Silverstein (2003), which they describe as taking small steps up a staircase moving from a 'lower to a higher level of understanding …(of) your research concern' (p.35). The research presented here is not based in the methodology of grounded theory but as the subjective values held by the two groups are unknown and therefore what, if any, similarities and differences between the two groups' values exist, this inductive method of investigation is appropriate. There are three phases in Auerbach and Silverstein's coding method: 'Making the text manageable', 'Hearing what was said' and 'Developing theory' (p.43). To enable this process the computer analysis software MAXQDA has been used.

In the first phase the research concern and theoretical framework determine which text is relevant text. As has been stated earlier this research is concerned with how the value of the subject of D&T is seen by different stakeholder groups as teacher education and the D&T curriculum goes through a period of change. The theoretical framework for the research is social constructivist, that is a person's values are derived and influenced by those in a position of authority in relation to the entity being valued as well as a person's lived history in relation to the entity; in this research lecturers and teachers are likely to influence or shape the values of the trainees as well as their personal experiences of D&T. Informed by this context and framework relevant text judged to be an example of a value was coded (note: Auerbach and Silverstein call these 'ideas'). For example from the sentence 'D&T is everywhere; it is such a diverse subject which can create many opportunities such as future employment prospects' the text 'future employment prospects' was selected as relevant.

In the second phase, the selected text was grouped into themes, which were labeled where possible with an excerpt from the original text minimising overlaying the interpretation of participants' values with my own values and personal D&T history as a teacher and teacher educator (Alvesson and Skoldberg 2009). This process was used for the two groups separately and the main findings are reported in the next section.

The third phase, 'Developing theory', brought together the themes from both groups into a series of abstract concepts. The definition of a value in Figure 1. was used to validate the consistency of these concepts. This compilation resulted in a series of values of D&T consisting of twenty-two discrete value statements (see Table 1), which is used later to explore and discuss the similarities and differences between the two groups. This reductive approach to analysis and comparison corresponds with pragmatic justification for comparing values rather than attitudes from Rokeach that a person has fewer values than attitudes (1968).

Analysis Phases one and two: Finding group's different themes about D&T's purpose

Comparison between the two groups' themes at this level is difficult due to the small number of academics interviewed compared to the number of trainees, so the results presented in this section were chosen for reporting because they were the most common themes by number of participants not the theme's frequency of occurrence, which could be skewed due to the larger number of trainees. Below the four highest-ranked themes from both groups are discussed in turn. Nineteen themes from the academics and twenty-four from the trainees were identified.

Trainees highest-ranked themes

Of the twenty-four trainee themes the four most common themes were mentioned by nine or more participants: freedom to be creative and innovative, developing personal skills, making a product of worth, and 'we are all users of technology therefore we should all be able to understand it'.

Theme 1: freedom to be creative and innovative

Twelve of the thirteen trainees identified creativity as being a key purpose of D&T. 'Creative', or derivations of, was used by ten of these students, with the other two using the synonyms 'imagination' and 'freedom'. These two explained that D&T provided 'freedom to explore ideas' or 'freedom to be creative', both aspects of creativity. One of the trainees mentions creativity as being important for a pupil after school, 'create ideas…for the future', and as well as related to children's activity in the present, 'create in many exciting ways' and 'freedom to be creative'. Most of the others focused on creativity being a purpose for children today, for example D&T being an 'opportunity for children to think creatively'. Two saw creativity as being a skill for the future: in D&T pupils could '[become] creative thinkers' and were learning 'creative [skills]'.

Theme 2: developing personal skills

In terms of the trainees thinking about the place D&T had for developing a pupil's character and qualities, ten trainees thought this was significant, making it the second most commonly occurring theme. Here they considered that by doing D&T in school the pupils would learn skills, such as the 'importance of following instructions', 'form(ing) their own opinions', 'problem solving and advanced logic' and 'develop useful decision-making and development skills'. These are transferrable skills, not necessarily unique to D&T but soft skills of the type looked for by many employers. Others were more vague in explaining what personal qualities and characteristics developed by doing D&T, mentioning it gave opportunity for 'developing the minds [of young people]' and 'developing personal qualities'.

Theme 3: making a product of worth

For nine trainees making a product, and in particular making their own products, was a key purpose of D&T. What the pupils would gain from this experience was the 'finished useful product', the 'visual representation of their achievements and hard work'. In doing this children would have opportunity to go through a process to 'meet human needs', use tools, and 'manipulate materials'. One student sums up this theme by stating D&T was where pupils were 'injecting their own personality into every piece of work that they produce'.

Theme 4: we are all users of technology therefore we should all be able to understand it

Nine trainees believed D&T would help 'prepare children for their future' to be 'responsible citizens who make a positive contribution to society', pupils were 'a user of technology therefore they should all be able to understand it'. Comments did not mention a specific technology, suggesting the trainees had a vague understanding of different types of technology (de Vries 2012), but implied a focus on D&T helping children to become 'informed users' and producing citizens that were 'critical, political [and] free-thinking'. Many of the comments were similar to one of the National Curriculum's overarching aims: 'The National Curriculum provides pupils with an introduction to the essential knowledge that they need to be educated citizens.' (Department of Education 2013b, p.6), which suggests again this theme might not be unique to D&T.

Academics highest-ranked themes

Secondly, the highest-ranked four from the academics, both in terms of frequency of occurrence and number of participants, was 'learning using brains and hands', 'acting on the world', 'learning skills and techniques' and 'creating things'.

Theme 1: learning using brains and hands

In contrast to the trainees first theme about creativity the academics highest-ranking theme was about learning. In their view there is a unique way of learning in D&T that gives the subject a value to being part of a school curriculum: 'a minds on as well as hands on'. The cognitive process the pupils are engaged in was significant to the academics, 'that coordination between brain and hands to the extent that you're problem solving continually into what it is that you are trying to make', the communication of the mind with paper as designs were created and developed. One asserted that the brain was working differently by pupils doing D&T: 'certain parts of their brain work that other subjects don't allow to work'.

Theme 2: acting on the world

Although only two academics highlighted this as a purpose of D&T between them it was mentioned nine times. Their view was that because of D&T pupils would be able to make a 'better world', 'improve the world' and do 'something for society as a whole'. One explained that children would be able to 'design things so they are may be more economical, they use less fuel, less energy to produce them'. For these two academics D&T was about developing a 'can do mentality' attitude, so the subject was part of a 'democratic curriculum'.

Theme 3: learning skills and techniques

Again only two academics mentioned this as a value of D&T, one of them once and the other on four occasions. The skills referred to are similar to the personal skills theme from the trainees: 'transferrable skills' and 'communication skills'.

Values (abstract concepts)	Academics	Trainees
Instrumental values		
1 Activity of designing	✓	
2 Alternative to academic subjects		✓
3 Designing for future needs and opportunities	✓	✓
4 Examination and questioning of the made world		✓
5 Freedom to take risks and experiment	✓	✓
6 Helps the understanding of human beings' position & existence	✓	✓
7 Identifying problems to be solved	✓	
8 It is fun and enjoyable	✓	✓
9 Learn from evaluating personal success and failure	✓	✓
10 Learning happens through using brains and hands together	✓	✓
11 Meaningful activity of solving real problems with real solutions	✓	✓
12 Personal ownership of decisions and actions	✓	✓
13 Provides a practical purpose for other school subjects		✓
14 Using raw materials to make a product	✓	✓
Terminal values		
15 Become aware of the economic impact of technological developments	✓	✓
16 Considers the ethics of technological development	✓	✓
17 Contributes to the nation's industrial and economic competitiveness		✓
18 Develops the skill of creativity	✓	✓
19 Develops the skills of autonomy and collaboration		✓
20 Empowers society to act to improve the world	✓	✓
21 Learn practical life skills		✓
22 Learning of vocational skills and techniques that open doors to careers	✓	✓

Table 1: Comparing values of D&T academics and trainee teachers by type

Theme 4: creating things
The academics' fourth theme, that D&T gives pupils the opportunity of 'creating things', and doing 'something that is in us all, which is enjoying creating things;' is similar to the trainees idea that D&T was valuable because pupils were 'making a product of worth'. But there are differences. The academics focused on the creation of a product and using materials to do this (both processes) whereas the trainees were focused on the end product (the outcome).

Analysis Phase three: Developing a theoretical framework to understanding the group's values
The forty-three themes from the two stakeholder groups were reduced to twenty-two concepts, and using the definition of a value presented in figure 1 each concept became a single value (Tables 1 and 2). For example the academics original theme of 'learning through using brains and hands' was joined with the trainees' theme 'engages pupils in different ways of learning'.

Whilst it is not claimed here that these values are the definitive values of D&T they do help to explain how and why the two groups have these values and where they might derive from; pragmatically they also facilitate comparison and analysis of the values of the two groups.

The values have been organised in two ways: by type (Table 1) and by classification (Table 2); both will be used to explore the results.

The two types of values are instrumental and terminal; instrumental values are defined as 'a desirable mode of conduct' (Rokeach 1973, p.7) and terminal relate to a 'desirable end-state of existence' (ibid, p.7).

The three classifications of the concept of values were identified earlier and define how the concept value is used differently in relation to D&T: 1. values in; 2. values developed through; 3. the value of.

Values (abstract concepts)	Academics	Trainees
Classification 1: Values in D&T		
1 Activity of designing	✓	
4 Examination and questioning of the made world		✓
7 Identifying problems to be solved	✓	
11 Meaningful activity of solving real problems with real solutions	✓	✓
18 Develops the skill of creativity	✓	✓
Classification 2: Values through D&T		
3 Designing for future needs and opportunities	✓	✓
6 Helps the understanding of human beings' position & existence	✓	✓
9 Learn from evaluating personal success and failure	✓	✓
12 Personal ownership of decisions and actions	✓	✓
14 Using raw materials to make a product	✓	✓
15 Become aware of the economic impact of technological developments	✓	✓
16 Considers the ethics of technological development	✓	✓
20 Empowers society to act to improve the world	✓	✓
Classification 3: Values of D&T		
2 Alternative to academic subjects		✓
5 Freedom to take risks and experiment	✓	✓
8 It is fun and enjoyable		✓
10 Learning happens through using brains and hands together	✓	✓
13 Provides a practical purpose for other school subjects		✓
17 Contributes to the nation's industrial and economic competitiveness		✓
19 Develops the skills of autonomy and collaboration		✓
21 Learn practical life skills		✓
22 Learning of vocational skills and techniques that open doors to careers	✓	✓

Table 2: Comparing value of D&T academics and trainee teachers by classification

Similarities and Differences by type of value
This section presents the similarities between the two groups by looking at the instrumental values and then the terminal values they both held. Values numbered 1 to 14 are classed as 'instrumental values' because they are values that have actions that are preferred during the study of D&T, whereas the terminal values 15-22 are values where the actions are seen after studying D&T, such as outside school, when they have left school and are working (see Figure 1). Although there is debate within the field of social science about this delineated classification of values as by changing the tense or rephrasing a terminal value can become instrumental and vice versa, they provide a useful method of exploring the similarities and differences between the D&T experts and trainee teachers. Within the instrumental value category there were more values held by the trainees than the academics (twelve compared with ten), eight of which were held by both groups, two by only the academics and four by the trainees only. The trainees held all of the terminal values whilst the academics only held five.

In terms of considering how D&T helped pupils whilst at school eight of the fourteen instrumental values were held by both groups. They said D&T was about individual pupils being able to learn in particular ways [learning happens through using brains and hands together] and use materials to make a product. D&T also helped pupils learn about making decisions [personal ownership of decisions and actions] and learn from trial and error [freedom to take risks and experiment; learning from evaluating personal success and failure]. They believed D&T was also about learning and doing activities that could involve and impact on others [designing for future needs and opportunities; meaningful activity of solving real problems with real solutions]. Finally they agreed that D&T gives pupils opportunity to consider the needs of others [designing for future needs and opportunities], and gave pupils a greater understanding about their role in the world [helps the understanding of human beings position and existence in the world].

They agreed on five of the eight terminal values. They decided that D&T developed the individual's skill of creativity, and that by D&T being taught in school people would be empowered to make changes [empowers society to act to improve the world] and take part in the world of work [learning vocational skills and techniques that open doors to careers]. They would also be able to have a wider view of the impact of future choices, for example when purchasing products [considers the ethics of technological development; become aware of the economic impact of technological development].

Of the fourteen instrumental values there were four held by the trainees only and two by the academics. Only one held by the trainees was clearly about D&T [examination and questioning of the made world], whereas the other three could be applied to several other school subjects [alternative to academic subjects; it is fun and enjoyable; provides a practical purpose for other school subjects]. The academics' unique instrumental value, activity of designing, could have been subsumed into the values about creativity or learning using brains and hands together but this activity is distinctive.

There was a similar pattern in the terminal values. The three held only by the trainees are not unique to D&T [contributes to the nation's industrial and economic competitiveness; develops the skills of autonomy and collaboration; learn practical life skills]. Whereas the unique terminal value held by the academics, identifying problems to be solved represents a concept of D&T that is also reflected in National Curriculum documents (see the 2003, 2007 and 2013 versions of the English D&T curriculum).

Similarities and Differences by classification of value
Five values are classed as values in D&T activity (values 1, 4, 7, 11 and 18); eight as values developed through D&T (values 3, 6, 9, 12, 14, 15, 16 and 20); and nine as values of D&T (values 2, 5, 8, 10, 13. 17, 19, 21 and 22).

Firstly of the five values in D&T only values 11 and 18 were agreed on by both groups and two values by the academics only (values 1 & 7) and one by the trainees (value 13).

Secondly both groups agreed on all of the values developed through D&T.

Finally the trainees held all of the nine values of D&T whilst the academics only held three (5, 10 and 22).

Discussion

An initial objective of this research was to compare how two stakeholder groups value D&T; with respect to this the findings reveal that whilst the two groups have some similar values there are some notable differences, both in the type and classification of values. The research's second objective was to provide some insight into why the two groups might have these values.

The first notable difference is that most of the values held by only the trainees are not unique to D&T, such as 'contributes to the nation's industrial and economic competitiveness' (value 17), whereas the two held only by

the academics are found in the origins of D&T (National Curriculum Council 1989 - known as the Parkes report). There are several possible explanations for these differences from both groups' perspectives.

One possible explanation might be that the younger trainees most recent educational experiences have not focused on D&T education and included other subjects or discipline fields, which are tangential to D&T, so even though they were asked to write about the purpose of D&T they may also have unconsciously included ideas about the purpose of education. The second possible explanation could be that those trainees who had recently left employment to enter teacher training may be reflecting on how they used at work what they learnt in D&T when at school. For example one trainee who had previously worked as a graphic designer can see the direct value of D&T in helping them gain employment in that career.

The second notable difference is the number of terminal values held only by the trainees, eight compared to five held by the academics. These group differences could be explained by age and period in their career and could account for the trainees identifying with the outcomes of education (terminal value) and the academics with the process of education (instrumental value). The trainees had just started a course that would lead to a career, a clear terminal value of their course; whereas the academics who are established in their D&T careers could be looking back through the lens of their research in D&T, particularly research which has been classroom based and focused on what and how children are learning in D&T.

The most striking variance was in the third category, the value of D&T, which consists of nine values; the trainees hold all of these but the academics hold only three. This difference may be explained by the experience of the trainees who are starting their careers with a view of D&T derived from their limited personal experience of D&T at school. This may explain why only they think D&T is of value because it is fun, enjoyable and a change from academics subjects. Also it might be due to them being in the early stages of their D&T careers and consequently having a weak philosophical understanding about D&T.

The limited trainees' personal view could be a consequence of their experience of D&T in school, explaining why they don't recognise that D&T can be about the process of designing or identifying the needs of others, both values central to the original purpose of D&T and held only by the academics. Contrariwise the values of the academics could be influenced by their wider experience of D&T based on their teaching, lecturing or research (see Martin (2013) for an example of how this might occur).

As the trainees progress through the year's training their values might change, influenced by the research and texts written by these academics; Schwartz (1994) predicts that a person's values can change and be acquired through 'socialisation to dominant group values' (p.21), so there is potential that during their course the trainees' values will become more aligned with the academics. However Dow (2014) argues that the 'academic (or espoused) theories' (p.151) seldom replace the implicit theories trainee teachers arrive with at the start of their training. Furthermore she warns that as a trainee becomes embedded in a school they acquire implicit theories and values from teachers, not that these values are necessarily false but they are 'shrouded in mists of the past' (p.151) and because of regular changes to government policy these values may not support the actual practice in schools.

Surprisingly, both groups agreed on all of the values from the second classification, 'values developed through'. There is no clear reason for this but it is interesting to speculate. These reasons could be due to their age and experience; they all experienced D&T since the National Curriculum's inception in 1990, with two exceptions – one trainee was in school before this period and one academic was from Australasia. Whilst only based on a small sample this encouraging finding shows that an agreed purpose of D&T is the development of technological literacy, although this is not to suggest that the trainees would understand this term at this stage in their careers or that the academics would agree on the term's definition.

These hypotheses based on the participants' age and experiences are consistent with Schwartz's (1994) view that a person's values can change 'through the unique learning experiences of individuals' (p.21).

The third objective of this research was to suggest some possible consequences of these differences and whilst the sample size is too small to project definite consequences there are two opportunities to speculate on implications. Firstly with regard to pedagogy and subject content it is conceivable that by emphasising the immediate value of D&T for pupils and with a limited view of its value beyond schools (using practical skills in the home and having a design-related career for example) the trainees might teach lessons that ignore the enduring value of D&T. If this is left unchallenged this could become the prevailing value profile of D&T in schools. This leads to the second speculative area, that of teacher training and the shift in stakeholder power.

As schools take more ownership of teacher training in England the value of D&T is likely to move further away from the D&T academics' influence and be based upon the 'spontaneous' (Dow 2014 p.151) values developed in classroom practice. The power and legitimacy of D&T academics will be in decline as the power and legitimacy of D&T teachers increases, particularly with regard to the subject's content and purpose. As the trainee teachers who hold the values presented here move into teaching posts, taking on more directive roles as teacher educators in schools for the next group of trainee teachers, their values will be shaping the values of these newcomers. The wider values held by the D&T academics could be lost as their number diminishes as teacher training units in universities close and they no longer have the legitimacy to direct new trainee teachers. This is only speculation but a possible early warning of the direction D&T, and other subjects, could take if teachers and trainee teachers become the primary legitimate and powerful stakeholders within the field of secondary education.

Finally the author does not suggest that other stakeholders would hold all these values and that there are no values of D&T other than those presented here, as the author recognises when reflecting on the interpretive limitations of this study. The author acknowledges she is an active participant in the research in three ways (Alvesson and Skoldberg 2009); she has been involved in the construction of the trainee teachers' values, the power relationship between her and the academics as she is an early career researcher and her own values of D&T will have been derived from engaging with the academics' work, and finally in her interpretation of the values because of the views she has of the value of D&T. For example she had to suppress her disagreement with some of the values expressed by the participants, such as value number two that D&T is of value because it is an alternative to academic subjects.

Use of the values series

Can the values in Table 1 be seen as the definitive guide to value of D&T? No. But in its current form it does have potential use on three levels: for an individual, to reflect on D&T in a school, and to understand national views. The series could be used to stimulate discussion and debate during teacher training programmes to help trainees question their own values and extend their philosophical view of D&T. It has already been used within two secondary schools to compare how the D&T teachers, pupils and school senior leaders value D&T (Hardy, Gyekye and Wainwright 2015), leading to changes in both D&T department's curriculum. As ITT changes alongside a new National Curriculum this series could provide a starting point for helping schools leading teacher training to ensure a breadth of purpose to D&T, rather than the narrower one exhibited in the new National Curriculum. Finally Keirl (2007) reminds us that 'D&T teachers periodically find themselves offering some sort of defence of the subject' (p.550) and so the series of values presented here could help D&T stakeholders celebrate D&T's strength and defend its contribution to a school's curriculum.

Internationally the series could be used to compare values held with trainees in other countries, for example in Sweden where the majority of technology teachers are not certified (see Hartell and Svärdh, 2012 in Hartell 2014) this series of values could help understand the values that the teachers need to develop for aligning to Sweden's national curriculum.

How could this series become more definitive? It presently only represents the values of two stakeholder groups, both within the secondary school sector. Further interviews with other stakeholders, such as pupils (primary and secondary), current D&T teachers and parents, would improve the cogency of future versions, particularly as teacher training becomes owned by schools and classroom teachers will have more influence over the values and theories of trainee teachers. Some of this work is currently been undertaken by the author for her PhD study that is aiming to identify and compare the values held by a wide range of stakeholders.

Conclusion

This research has demonstrated that the values of trainee teachers about D&T can be gathered from a written assignment. It has also demonstrated that comparable values can be derived from interviews with D&T academics.

The data gathered was analysed to show 14 instrumental values and 8 terminal values. Comparison of the values of the two groups, trainees and academics, showed that the trainees held a greater number of values than the academics. This was true in both the instrumental and terminal category.

The second major finding was in the three different classifications of values: 5 'values in D&T', 8 'values developed through D&T', and 9 'values of D&T'. The two stakeholder groups agreed on all of the second classification but only two and three respectively of the first and third classification.

In interpreting the results it was clear that their experiences from D&T (as pupils, teachers, in employment outside

education and as D&T researchers) and the stage the two groups were at in their careers has influenced their values.

The small samples made it difficult to reach definitive conclusions, but the pilot study showed that different stakeholders do have different values of D&T. This is the first study in D&T that has derived values held by stakeholders and then compared them.

However, this series does have a limitation. Currently it only represents the values of the two groups discussed here. Future versions need to include the opinions of others if it is to be a more definitive series of values, work currently been undertaken by the author.

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