What do others think is the point of design and technology education?

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As a result of a national curriculum review in England (Department for Education [DfE], 2011), a new curriculum for design and technology (D&T) is being taught in secondary schools from September 2014 (Department of Education [DoE], 2013a). This curriculum is compulsory for a decreasing number of schools; two potential consequences are the nature of D&T in secondary schools changing to reflect local perceptions of the subject and maybe D&T being removed from the curriculum completely. The pressure on D&T's curriculum content is likely to come from different stakeholders such as senior school leaders, D&T teachers, and pupils. D&T school departments could respond to this pressure by adapting the curriculum to popularise the subject or produce high exam results with a consequence that much of the subject's value is lost.

This paper reports on a small research project conducted in two secondary schools where stakeholder representatives were interviewed to identify their values of D&T. These different stakeholders were interviewed using the active interview method (Holstein & Gubrium, 1995), coded following Aurebach and Silverstein's method (2003) and their values compared to Hardy's values framework (Hardy, 2013b). Analysis shows most stakeholders believe a key value of D&T is to provide 'practical life skills' (Hardy, p.226), whilst only one recognizes that learning in D&T involves 'identifying problems to be solved'.

The outcomes from the research are being used to support critically reflective conversations within both D&T departments (Zwozdiak-Myers, 2012) framing their evaluation of their local curriculum and making changes to their curriculum.

Key words: Values, stakeholders, design and technology

Introduction

A new curriculum for design and technology (D&T) has been taught in English secondary schools since September 2014 (DoE, 2013a) but it is compulsory for a decreasing number. Two potential consequences are the nature of D&T in secondary schools changing to reflect local perceptions of the subject, such as to support pupils into local employment by providing vocational education, and maybe D&T being removed from the curriculum completely. Pressure for change will probably come from key stakeholders, such as senior school leaders, D&T teachers, and pupils, who may have conflicting views about the purpose of D&T.

Our research question is: how do three different stakeholders in schools value D&T and what are the similarities and differences in their values? This research explores three stakeholders groups' values of D&T in order to help D&T teachers in schools understand where there maybe conflict and consensus about the purpose of D&T. We will show how two schools have begun to reflect on these values in order to clarify the purpose of D&T in their schools.

Context

Previous studies in technology education about attitudes and values have primarily focused on attitudes towards technology (For example: Ardies, De Maeyer, & Gijbels, 2013; Chikasanda, Williams, Otrel-Cass, & Jones, 2012; Volk, 2007). We have decided to use values following critical analysis of Rokeach's investigations about how values and attitudes interdependency impacts on behavior. He determined that 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). He argues that because values are enduring they influence attitudes and behavior; therefore by understanding stakeholder's values D&T teachers can take steps to change people's attitudes and behavior towards D&T if necessary.

There are two significant, timely arguments for this research; firstly a new National Curriculum and secondly changes to the state school system.

A new D&T curriculum was published in February 2013 (DoE, 2013b) and then rewritten (DoE, 2013a), with the final version being taught in schools from September 2014 (DoE, 2013a). Analysis of the first version revealed some alarming values of D&T potentially held by the (unknown) author/s, which some influential stakeholders agreed with (Dimbleby, 2013; Royal Horticulture Society, 2013). Although derided by the D&T community (Design and Technology Association, 2013; E4E, 2013; Hardy, 2013a; Prince, 2013) it is useful to remember that there are some stakeholders who believe this is the value of D&T. By exploring what people, other than D&T teachers, think is the point of D&T we hope to help D&T teachers understand how others perceive the subject, which in turn might help them reflect on the consequences of some of the D&T learning activities (Zwozdiak-Myers, 2012) and respond to any pressures they might be under to change the philosophy and direction of D&T.

The second argument is about the type of state schools pupils can now attend: free schools, faith schools, academies and community schools. Each has different structures and regulations but the most significant difference affecting D&T is that academies do not have to follow the National Curriculum, it can be decided at local level and designed to meet the community and business needs. Consequently the views and values of academy senior leaders towards D&T could have a significant impact on who teaches or studies D&T. With 56% of all secondary schools in England (Mansell, 2014) now academies we argue this time-context provides an imperative for the D&T community to determine how a school's stakeholders view D&T.

This research is based in two academy schools; St. John's is a city school with a Christian approach and Upton School, in the same city's suburbs.

Each stakeholder in a school's curriculum has different priorities for a curriculum and can be categorized based on differing attributes (Mitchell, Agle, & Wood, 1997). Williams (2007) illustrates the applicability of Mitchell et al's (1997) theory of stakeholder identification in determining the salience of different stakeholders dependent on their attributes. Taking Mitchell et al's definitions of the three attributes we have customized them for school stakeholders rather than business stakeholders: "(1) the stakeholder's *power* to influence the [curriculum], (2) the *legitimacy* of the stakeholder's relationship with the [curriculum], and (3) the *urgency* of the stakeholder's claim on the [curriculum]" (derived from Mitchell et al., 1997, p.854).

So which stakeholders' values should be explored? Using this theoretical framework and William's examples we have focused on three stakeholder groups ensuring coverage of the attributes:

- Senior leaders have power to influence the curriculum through organization of the curriculum (timetabling), resources (budgets) and awarding status (profile), urgency because of the demand for success in national league tables.
- D&T teachers have legitimacy through their relationship with D&T and power because of their influence in the classroom (Dakers, 2005).
- Pupils have urgency because of their claim (need) on the subject and legitimacy because their education is affected by D&T.

Method

In Upton School three D&T teachers and two senior leaders were interviewed and in St John's two from both groups were interviewed (Table 1). In both schools pupils in year 9 choose whether they will continue studying D&T towards a qualification in years 10 and 11; the eleven pupils interviewed were year 9 (fourteen years old) and included pupils who were both going to continue with D&T and those who were not.

We were conscious that each stakeholder's 'stock of knowledge' (Holstein & Gubrium, 1995, p.30) might be drawn from more than one perspective. Although we initially placed participants in one stakeholder group there was potential for them to belong to more than one group, having more than one narrative about D&T. Consequently all stakeholders completed a pre-interview questionnaire; the teachers and senior leaders gave information about themselves and their personal D&T history (Did they study D&T at school? What was it called?). We compiled this information and used Martin's (2013) five eras of D&T (making, personalising, designing, manufacturing and valuing) to determine in which era the participant studied D&T at secondary school; our participants only represented four eras. By using Martin's theoretical framework we hoped it might help us explain why different stakeholders held different values.

Participant & stakeholder group	**Gender**	**Age**	**Era**
Upton pupil group 1 (5 pupils)	F & M	14	Values
Upton D&T teacher 1	F	52	Making
Upton D&T teacher 2	F	22	Values
Upton D&T teacher 3	F	61	Making
Upton senior leader 1	F	52	Making
Upton senior leader 2	F	30	Manufacturing
St John's pupil group 1 (3 pupils)	F & M	14	Values
St John's pupil group 2 (3 pupils)	F & M	14	Values
St John's D&T teacher 1	F	26	Manufacturing
St John's D&T teacher 2	M	45	Making
St John's senior leader 1	F	35	Personalising
St John's senior leader 2	M	37	Personalising

Table 1: Profile of participants

Two of the three researchers are D&T teachers in the schools, the third an academic at the local university. This had ethical implications for the collection, data analysis and

interpretation. The school-based researcher made the initial contact with potential participants and contacted pupils' parents. Interviews were conducted by the university-based researcher, recorded with permission and later transcribed. Teachers and senior leaders were interviewed individually and face to face with only the interviewer present; pupils were interviewed in groups with a schoolteacher present. The school-based teacher from Upton was one of the participants as well.

Holstein and Gubrium (1995) argue that the relationship between the interviewer and interviewee can be active; they interact and create the knowledge collaboratively, which was our approach to the interviews. The interviews were structured slightly differently for each stakeholder group: pupils choose one photo from a selection picturing different D&T activity that was the closest representation for them of D&T, the photos helped them explore what was the point of D&T. The same photos were used with senior leaders but the interviews explored what they thought was the purpose of the D&T activity in the photos. The teachers were asked to talk about the value of the pupils' learning in their most recent D&T lesson. From all of these positions the interviewer was able to explore their opinions about D&T, why it was useful, how it helped them today and in the future, also its unique place in the curriculum.

Data analysis

Firstly we applied Value Codes (Saldaña, 2012) to all the interview transcripts using Rokeach's definition to identify a value:

'an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse model of conduct or end-state of existence'

(Rokeach, 1968, p.160)

To test the coded value was a D&T value we checked that it either:

- Explained why the speaker thought pupils should do D&T or
- Gave some benefits of doing D&T or
- Justified the point and purpose of D&T.

Next we established intercoder reliability for three interviews, agreeing the first code values and then individually consolidated the value coding for different stakeholders. The two school-based researchers only consolidated codes from the other school, not their own.

The second phase of coding was elaborative (Auerbach & Silverstein, 2003; Saldaña, 2012) building on previous research by Hardy (2013b) that explored the values espoused in writing by trainee D&T teachers and interviews with academics from the discipline of D&T education. In her research Hardy identified the values using the same definition and checklist above to find themes (Auerbach & Silverstein, 2003) leading to a series of twenty-two different values (see appendix). Hardy does not claim these values to be definitive but only from these two stakeholder groups, so in part we saw this research as an opportunity to develop Hardy's original framework but we also used it for deductive coding purposes (Miles, Huberman, & Saldaña, 2013) to facilitate the comparison between our three stakeholder groups. To compare the coded values we used the computer analysis data software MAXQDA.

Findings

First coding revealed 673 text segments identified as a value, in the second phase of coding forty-five items could not be assigned to one of Hardy's twenty-two value codes. The most commonly assigned value was 'learn practical life skills' with 120 coded segments, the second was 'using raw materials to make a product' (n=62) and 'identifying problems to be solved' was not recognized as a value of D&T by any of the stakeholders.

Senior leaders and D&T teachers at St John's School hold the same values of D&T (21 out of a possible 22), where as the pupils hold a more limited range (12/22). At Upton School there was no obvious correlation between the three groups, but the senior leaders do hold a wider range of values (18) than both the D&T teachers (14) and pupils (14).

Analysis

Our research question was: how do three different stakeholders in schools value D&T and what are the similarities and differences in their values? We explored the similarities and differences between three stakeholder groups' values in two schools: pupils, senior leaders and D&T teachers. We have also done further analysis to see if the stakeholder's age might have a bearing on their values.

Pupils' values

None of the pupils interviewed held any of these values of D&T:

- Meaningful activity of solving real problems with real solutions
- Designing for future needs and opportunities
- Freedom to take risks and experiment
- Identifying problems to be solved
- Helps the understanding of human beings' position and existence in the world

Whereas at least one pupil in each of the two schools held nine of the values of D&T:

- Empowers society to act to improve the world
- Personal ownership of decisions and actions
- Learning of vocational skills and techniques that open doors to a range of careers
- Alternative to academic subjects
- Activity of designing
- Provides a practical purpose for other school subjects
- Examination and questioning of the made world
- Using raw materials to make a product
- Learn practical life skills

Senior leaders' values

One idea that arose from our research question was that D&T teachers would have the widest view of the subject, followed by pupils and then senior leaders; in fact the reverse is true. We were initially surprised that the senior leaders have one of the widest views of D&T, but further reflection and discussion acknowledged that their wider school role would probably influence their view of each subject's contribution to a pupils' education.

D&T teachers' values

We did not anticipate the narrowness of the values held by the D&T teachers from Upton School. For example none of the Upton teachers held seven of the values, including:

- Learning happens through using brains and hands together
- Empowers society to act to improve the world
- Designing for future needs and opportunities
- Provides a practical purpose for other school subjects

We were not surprised to see that D&T was identified as a subject that led to vocations, correlating to the nineteen separately coded segments when D&T teachers indicated a purpose of D&T was to help the pupils in 'jobs they're going to do in the future'; but we were disheartened that the teachers suggested on forty-four separate occasions that a purpose of D&T was to provide pupils with practical life skills (6.5% of the total number of coded segments – the highest weighted value by the teachers).

Values and the five eras

In our conceptual framework time was linked to values through the implementation of a new curriculum and changes to a school's structure. It also made sense to consider if the time the participants studied D&T made any difference to their values (Martin 2013).

Using Martin's suggestion that there have been five eras of D&T we proposed that stakeholders over the age of forty would have experienced a curriculum that focused on making and we might expect to see this reflected in their values. When we considered the variable of age we could see some differences, but taking into account the number of participants it is difficult to suggest any significant reasons for these.

Discussion

Most disquieting to us was that none of the stakeholders believe that D&T is a subject that involves 'identifying problems to be solved', both the previous (Qualifications and Curriculum Authority, 2007) and current National Curriculum (Department of Education, 2013b) expect children to be able to do this. We think this has implications for the curriculum content in both schools.

Five of the values not recognized by pupils relate to either being free to design or free to consider wider society issues. We wondered if this was due to the nature of D&T activity primarily undertaken in their secondary schools.

The breadth of values held by the four teachers from the making era surprised us, but closer analysis revealed it was the St John's D&T teacher who held the widest range. This teacher was the subject leader, working with a young team of D&T teachers, he is also studying at postgraduate level and it is plausible that these three factors have contributed both to his number of values and the impact he has had on the values of the other teacher in the department and the senior leaders. The other three teachers in the making era group were from Upton, over 50 years old and female, two of them were D&T teachers and between them identified that D&T was about life skills nineteen times.

The values profile of the Upton D&T teacher who was also a researcher (Upton D&T teacher 2) in her first year of teaching and from the values era was consistent with the profile and weighting of the other two Upton D&T teachers. This was a surprise to us, and more personally to the researcher; we think the impact of 'implicit attitudes and theories' (Dow, 2014, p.152) could go some way to explaining this similarity. In her personal reflection on the research process she wrote 'this (first) year felt (like) mainly ticking boxes, exhaustion, all new, pressures for contract to be made permanent and fitting in with school life. Didn't have many opportunities to question why I was doing particular lessons and what the students were actually learning – if any value to them both present and future'. Although this reflection has caused the researcher to feel slightly despondent there is an underlying strength to this department, its' cohesion and the close alignment between the pupils and D&T teachers values of D&T. Consequently we think this area is worth further exploration as the age and experience profile of a department could have implications for the values held by pupils and younger teachers, and for teacher training institutions (Dow, 2014).

Implications for Upton and St John's D&T Departments

At Upton School the school-based researcher is considering whether the school's schemes of work reveal more traditional beliefs and values of D&T and if this could be part of the reason for the limited view of D&T the pupils have. As a new teacher she is also using the

findings to develop her own practice and confidence: '(The) research has helped me understand (the) department's philosophy, I think it will impact on my confidence to explore away from department (within reason). (Setting) themes for students to explore as opposed to narrow briefs'

The school-based researcher from St John's School is more established and been in post for over three years, recently taking a curriculum leadership position in the department. This research has helped her clarify her thinking about D&T and been able to communicate that with her department. Consequently new activities are in place, which she hopes will align the teachers' values with those of the pupils.

Conclusion

There were two parts to our research question of this paper, firstly how do three different stakeholders in schools value D&T and secondly what are the similarities and differences in their values?

All stakeholder groups held a range of values, the most significant of which was that D&T provided practical life skills, the second most common was that pupils had the opportunity to make products. Using Hardy's (2013b) values framework to analyse the stakeholder groups' values we saw that whilst there were several core values no one thought D&T provided an opportunity for pupils to identify problems to be solved.

Analysing the values across the stakeholder groups within a school and between groups across the schools we determined that the senior leaders in both schools held the widest view about the value of D&T and the pupils had the narrowest view. Our interpretation was that the senior leaders position gave them the greatest understanding how D&T contributes to a pupil's whole education. In both schools D&T teachers rated highly the subject's practical content. One explanation for this is that the teachers were focusing on the unique practical aspect in order to influence the year 9 pupils to choose to continue with their D&T study the following year.

There were noticeable similarities and differences between the groups within the schools. In Upton School the D&T teachers and pupils' values were more closely aligned to each other than the senior leaders'; the converse was true at St John's. Our view is that this could be influenced by factors such as the teachers' ages and the classroom activities.

This research shows that different groups and different schools have similar and different values of D&T; we cannot say yet if this will have a consequence on the place of D&T in these two schools. That is not to say that the consequence will be negative given our finding that senior leaders have the widest view and the greatest power to retain D&T in a school's curriculum. However if our findings about the values held by D&T teachers are more aligned to those held by the Upton School teachers then the challenges faced by other D&T stakeholders (teacher trainers, university lecturers) could be significant. D&T teachers have the power and legitimacy to influence what happens in the classroom, and it is this that influences the perceptions of those with a more wide-ranging power, such as head teachers and government ministers. In our opinion a key challenge is to address the dominant view that D&T's purpose is to teach practical life skills and bring forward the values relating to D&T's capacity to improve society's quality of life.

This research could have broader implications for other countries that are also considering the place, purpose and value of D&T in the curriculum.

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Appendix

Twenty-two values of D&T from Hardy (2013b).

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

22. Learn practical life skills