A DEVELOPING PROJECT: INVESTIGATING FUTURE FORMS OF DESIGN AND TECHNOLOGY EDUCATION

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ABSTRACT

It is regularly reported at previous PATT conferences that design and technology (D&T) in England is in decline. Despite initiatives, new curricula and government lobbying, the D&T juggernaut seems to be on the brink of collapse (according to some), with lowering numbers of pupils studying D&T, fewer teachers, less resources, and low status in schools.

Pulling the D&T juggernaut back from the brink requires more than one approach and most of the recent ones have been led by national organisations. This paper reports on the first phase of a new project, led by practising teachers, that takes a new approach. In simple terms, the aim of the project is to redesign D&T, not so much the content but the curriculum delivery and framework.

We have started by identifying the unresolved issues that are causing curriculum tensions and incoherence in the D&T community.

In this paper we are reporting on the first phase of our design project, where we used a Delphi Study to identify the controversial D&T curriculum issues that need resolving before we can design a D&T curriculum. Nineteen teachers completed the first survey. Analysing of the survey data reduced the number of questions to 24. These were circulated to a self-selecting expert group (participants who completed the first survey). A second round of analysis has clarified that there are 18 unresolved questions and contentions issues that need to be debated.

The next step is to invite teachers to respond to these issues; these responses will then be shared in a publication, debated, and shaped into a curriculum design specification.

Finally, teachers will be invited to share at a future workshop or conference their curriculum design ideas that meet this specification.

Key Words (Provide between 3 and 5 key words): curriculum, teacher researcher, practitioner researcher, Delphi Study.

1. INTRODUCTION

It is regularly reported at previous PATT conferences that design and technology (D&T) in England is in decline (e.g., Hardy, A. et al., 2015; Martin, 2012; Vickery, 2022). (Hardy, Alison, 2021; Hardy, Alison L., 2017; Hardy, Alison L., 2018). Whilst student entries for D&T have been in decline since 2001, when the subject became non-compulsory at key stage 4, there has been a significant decline within the past decade. GCSE candidates have dropped by 72% from 2010 (277,701) to 2022 (77,531) and in the same period, A-Level numbers have dropped by 38% from 18,417 to 11,404 (Joint Council for Qualifications, 2023). Despite policy initiatives, such as including creating a new performance measure - 'Progress 8', there has been no observed reversal in this decline; implying that there are wider issues impacting the uptake of the subject. Simultaneously, the shortage of qualified teachers within the field only exacerbates this issue. The Education Policy Institute highlights that the number of qualified D&T teachers reduced from 6% to 3% of all teachers from 2011 to 2020 with D&T recruitment only meeting 23% of its overall target in 2021/22 (EPI, 2022). The scarcity of expertise within schools undermines the potential growth of the subject and hinders its ability to meet the pupils' and societies needs from education.

The subject is now commonly discussed in association with declining student enrolment numbers and shortages of qualified teaching staff (DATA, 2022). This trend is of great concern amongst educators and industry professionals as it raises questions about whether the current curriculum of D&T is adequately preparing students with the skills and competencies they will need in the workplace (Meyer & Norman, 2020) and beyond.

Notably, creativity has emerged as a crucial focus in education, particularly within the context of 21st century learning and is widely recognised to be central to the subject. (Collard & Looney, 2014; Spendlove & Hopper, 2004).

This has led to discussions about if the current English D&T curriculum is fit for purpose (Spendlove, 2021; 2022). If not, should the design of a new curriculum be led by politicians, policy writers and non-practising teachers (e.g., academics who are researchers) or by the practising teacher community (Norman, 2021)? Our view is that it is time for practising teachers to not only be consulted but to lead the consultation and (any) redesign. This idea aligns with Phil Roberts' (2001) support for teachers-as-researchers and has led to a small group of D&T teachers, supported by an academic, to lead a design project 'Redesigning D&T'.

This project was first mooted in the book "Redesigning D&T … Talking … Thinking" (Hardy, Alison & Norman, 2021) and ended with a call to action for the development of first a design specification for a new curriculum, which would lead to a new D&T curriculum. Norman (2021,

p.108) argues that “teachers’ reflections on the direction that designing in schools should take could [should?] plan a fundamental role in the subject’s reform”.

Recently developments by Pearson’s exam board (2023) and the Design and Technology Association (2022) have invited teachers to be involved in contributing to their ideas but both have been led by the organisations; the Redesigning D&T project, whilst instigated by an academic is now led by three practising teachers, with the academic facilitating the process and supporting with ethics and funding opportunities.

1.1. A DEVELOPING PROJECT: INVESTIGATING FUTURE FORMS OF DESIGN AND TECHNOLOGY EDUCATION

1.1.1. Project Aim

The aim of the study is to design a new D&T curriculum for teaching in England to primary and secondary schools. We aim to develop D&T curriculum through consensus using a design-based approach. We are not so much focussing on the curriculum content, but on the curriculum design, implementation, and framing of the curriculum.

1.1.2. Project phases

Using the Delphi technique (Keeney et al., 2011), the Redesigning D&T project aims to develop the D&T curriculum for teaching in England to primary and secondary schools through the consensus of members of the D&T teaching community. To achieve this aim there are several phases:

- Phase 1: Identification of the big or controversial D&T curriculum issues (COMPLETED).
- Phase 2: Debating the controversial D&T curriculum issues and reaching consensus (IN PROGRESS).
- Phase 3: Designing and evaluating curriculum solutions in response to the consensus.
- Phase 4: Agreeing on a new D&T curriculum.

In the first phase there were two rounds:

- In round 1 members of the D&T teaching community to respond to a survey detailing some big or controversial D&T curriculum issues identified by two academics (Alison Hardy and Eddie Norman). Responses were collected via Qualtrics, and participants were invited to form an expert group and or join the project team.
- In round 2 the self-identified expert group responded to a questionnaire (also on Qualtrics), where they were asked to prioritise the issues identified in round 1.

This paper reports on phase 1 only and concludes with a description of the next phase which we started in July 2023. We will report on some of the preliminary findings from phase 2 at the conference in November.

1.1.3. Project team

Initially eight teachers indicated they would be part of the project team, but due to other commitments this has now become three teachers leading the project: Ciaran Ellis, Andrew Halliwell and Amanda Mason. Alison Hardy continues to facilitate, providing research guidance and leading on the ethics applications (processed via Nottingham Trent University).

2. PHASE 1, ROUND 1

Participants in the first-round were presented with a list of questions. These were determined before the research team was formed but seen as challenges D&T faced, questions that still need answering, or is still being debated, or where there is no clear response. The first round of questions were put to the public via social media and through Alison Hardy's podcast. Here, it was also explained the purpose behind the research project, alongside the initial list of potential questions (Figure 1). The aim of this first round was to form a consensus on which questions were to be used for the final round of phase 1 and for phase 2.

Figure 1
Controversial questions (Phase 1 Round 1)

Nature of D&T

1.D&T is a vocational subject
2.Should the subject be called 'design' or 'design and technology'?
3.What's the technology in design and technology?
4.Does D&T actually make a difference to industry?
5.Do designers know anything?
6. D&T is not an inclusive subject

Content

7. Design: is it art or technology or science or humanities?
8. Craft has no place in D&T
9. Is there design knowledge?
10. What is interdisciplinary knowledge?
11. Is making vital to D&T?
12. Is there a design process?
13. Has science got anything to do with D&T?
14. What is design thinking?
15. What do values have to do with D&T?
16. Are textiles just another material in D&T?
17. Are some materials more important than others in D&T?
18. Are materials just another technology?

Learning and assessment

19. Do children need to be skilful makers and modellers?
20. Should children make what they design?
21. Can you start a D&T project without knowing anything?
22. Should children be taught cognitive modelling?
23. Do we teach skills in D&T? What do we mean by skills in D&T?
24. Do you need a workshop? Or any specialist space?
25. Is the outcome more important than the process?
26. Can we assess design?

The survey structure followed the Delphi process (Keeney et al., 2011) and the participants were asked to:

(i) identify which questions agreed needed to be debated.
(ii) identify which questions they disagreed and felt did not need to be discussed.
(iii) detail any questions they considered had been missed from the list.

Unfortunately, the responses to this last question indicated a confusion about the purpose of the survey, resulting in many participants writing answers to the questions. For example:

> "Do children need to be skilful makers and modellers [question 19]
>
> There is too much emphasis on the perfection and making something that works... there needs to be about the process - like in mathematics - it is not answer that gets the mark - it is the process."

Finally, participants were also asked if they would like to be more involved with the project and or would promote the survey to others (i.e. snowball sampling (Braun & Clarke, 2013)). Those who wanted to join the project team were invited to an initial meeting with Alison Hardy who explained the project in more detail and the teachers identified which part of the project they wanted to be involved in (e.g., data analysis, project promotion or publications).

The survey data was then shared with the data analysis team. From the 22 responses, 6 replied no to each answer and offered no further suggestions to which questions should or should not stay for the next round. The data team then decided on which questions were to stay. There was consensus that question 1 and 9 (Figure 1) were to remain and was a question that still needed debating, alongside questions, 2, 4, 8, 11, and 12. Other questions, although with a smaller number of responses naming them were questions, 3, 7, 13, 14, 16, 17, 19, 20, 21, 22, 23, 25 and 26.

The data team discussed the wording of some of the questions. For example:

- 'Craft has no place in D&T' seemed a leading statement and so was rephrased to 'Does craft have a place in D&T?'.
- 'Has science got anything to do with D&T?' was re-worded to 'What subjects should be in D&T?'.
- Q16 and 17: it was felt as though these questions seemed to warrant very similar responses and so were merged to create the question 'Are some materials more important than others in D&T?'

Even though some questions were not agreed or disagreed with, the team adjusted the wording:

- Q6 'Is D&T in England Eurocentric?' was changed to 'What does a global D&T curriculum look like?'

- Q10 ‘What is interdisciplinary knowledge’ rephrased to ‘Is there a core body or knowledge for D&T or is its knowledge drawn from other disciplines/subjects?’
- Q15 ‘What values have to do with D&T?’ re-worded to Do design decisions involve making value judgements? What do value judgements have to do with D&T?’
- Q18 was removed, it was felt this would be answered in the newly formed question from merging Q16 and 17.

This resulted in the new list of questions that would go forward to round 2 (Figure 2).

Figure 2
Consolidated controversial questions from Phase 1 Round 1

Nature of D&T
1. D&T is a vocational subject 2. What should the subject be called? 3. What’s the “technology” in design and technology? 4. What are the technologies in design and technology? 5. Does D&T make a difference to industry? 6. What does a global D&T curriculum look like?
Content
7. Design: is it art or technology or science or humanity? 8.Does craft have a place in D&T? 9.Is there design knowledge? 10.What do we mean by skills in D&T? 11. Is there a core body of knowledge for D&T or is its knowledge drawn from other 12.disciplines/ subjects? 13.Is making vital to D&T? 14.What is design thinking? 15.Do design decisions involve making value judgements? What do value judgements have 16.to do with D&T? 17.Are some materials more important than others in D&T? 18.What subjects should be in D&T?
Learning and assessment
19.Do children need to be skilful makers and modellers? 02.Should children make what they design? 21.Can you start a D&T project without knowing anything? 22.Should children be taught cognitive modelling? 23.Do we teach transferrable skills in D&T? 24.Do you need a workshop? Or any specialist space? 25.Is the outcome more important than the process? 26.Can we assess design?

3. PHASE 1, ROUND 2

In round 2, participants were asked to rate each question, indicating on a Likert scale where that question still needed resolving: “strongly agree” that this would be a question that still needed debating, to “strongly disagree” if they was felt that the question did not need further discussion. This rating systems allowed for the survey to be completed quickly and the data analysis process

was different to that used in round 1. The survey was shared with the original 22 respondents to round 1; 9 responded.

Using the cumulative data seemed the most appropriate information to use, as it was clear when using the 70% margin from the Delphi technique, which questions could be used in Phase 2. Using the cumulative percentage data for those who responded "strongly agree", "somewhat agree" and "neither agree or disagree", we determined the questions to be used on Phase 2 would be where the cumulative percentages were 70% and above. Following this rule, we were able to remove questions, 2, 4, 6, 15, 19 and 20 from the list, leaving the finalised list of questions going into phase three of the project, asking for teachers to have their say (Table 1).

Table 1
Phase 1, Round 2 data

				Cumulative				
		Average	STD	Strongly agree	Somewhat agree	Neither agree or disagree	Somewhat disagree	Strongly disagree
1	D&T is a vocational subject	31.22	1.48	22.2%	55.6%	88.9%	100.0%	100.0%
2	What should the subject be called?	30.89	1.54	22.2%	33.3%	55.6%	77.8%	77.8%
3	What is the 'technology' in design and technology?	31.44	1.01	11.1%	55.6%	77.8%	77.8%	77.8%
4	What are the technologies in design and technology?	31.33	1.00	11.1%	44.4%	66.7%	66.7%	66.7%
5	Does D&T make a difference to industry?	32.00	1.00	33.3%	77.8%	88.9%	88.9%	88.9%
6	What does a global D&T curriculum look like?	31.88	0.83	25.0%	62.5%	62.5%	62.5%	62.5%
7	Design: is it art or technology or science or humanity?	31.25	1.67	25.0%	62.5%	75.0%	100.0%	100.0%
8	Does craft have a place in D&T?	31.25	1.39	12.5%	62.5%	87.5%	100.0%	100.0%
9	Is there design knowledge?	32.75	0.46	75.0%	100.0%	100.0%	100.0%	100.0%
10	What do we mean by skills in D&T?	32.63	0.52	62.5%	100.0%	100.0%	100.0%	100.0%
11	Is there a core body of knowledge for D&T or is its knowledge drawn from other disciplines/ subjects?	32.25	1.39	62.5%	87.5%	87.5%	100.0%	100.0%
12	Is making vital to D&T?	32.38	0.74	50.0%	87.5%	87.5%	87.5%	87.5%
13	What is design thinking?	32.25	0.89	50.0%	75.0%	75.0%	75.0%	75.0%
14	Do design decisions involve making value judgements?	31.75	1.04	25.0%	62.5%	75.0%	75.0%	75.0%
15	Are some materials more important than others in D&T?	30.75	1.49	12.5%	37.5%	62.5%	75.0%	75.0%
16	What subjects should be in D&T?	31.75	1.49	37.5%	75.0%	87.5%	100.0%	100.0%
17	Do children need to be skilful makers and modellers?	31.75	1.04	25.0%	62.5%	75.0%	75.0%	75.0%
18	Should children make what they design?	31.25	1.16	12.5%	50.0%	87.5%	87.5%	87.5%
19	Can you start a D&T project without knowing anything?	30.88	1.25	12.5%	25.0%	50.0%	62.5%	62.5%
20	Should children be taught cognitive modelling?	31.50	1.20	12.5%	62.5%	62.5%	75.0%	75.0%
21	Do we teach transferrable skills in D&T?	31.88	1.55	50.0%	75.0%	87.5%	100.0%	100.0%
22	Do you need a workshop? Or any specialist space?	32.38	0.52	37.5%	100.0%	100.0%	100.0%	100.0%
23	Is the outcome more important than the process?	31.38	1.51	25.0%	62.5%	87.5%	100.0%	100.0%
24	Can we assess design?	31.88	1.36	37.5%	75.0%	75.0%	87.5%	87.5%

Figure 3
Final questions for Phase 2

1. D&T is a vocational subject?
2. What does the 'technology' in design and technology?
3. Does D&T make a difference to industry?
4. Design: is it art or technology or science or humanity?
5. Does craft have a place in D&T?
6. Is there design knowledge?
7. What do we mean by skills in D&T?
8. Is there a core body of knowledge for D&T or is its knowledge drawn from other disciplines/ subjects?
9. Is making vital to D&T?
10. What is design thinking?
11. Do design decisions involve making value judgements?
12. Do children need to be skilful makers and modellers?
13. Should children make what they design?
14. Can you start a D&T project without knowing anything?
15. Do we teach transferrable skills in D&T?
16. Do you need a workshop? Or any specialist space?
17. Is the outcome more important than the process?
18. Can we assess design?

4. WHAT'S NEXT?

Now we have finalised the contentious questions, we are circulating them on social media, via mailing lists and through the project team's contacts. In phase 2, we are inviting practising D&T teachers to write, video, record or sketch a response to up to four of the 18 questions. The deadline for the responses is later in 2023, after then the project team will edit and collate them into a publication, which will be available to purchase at a not-for loss rate. Our ambition is to secure funding to host a face-to-face debating day in 2024, bringing together practising teachers to debate and vote on each of the questions, leading to a consensus. This would be the end of Phase 2 and the selected debate for each question would be published as a curriculum design specification. Teachers would then be invited to share their design ideas for this specification. We anticipate the ideas will take the form of a curriculum model, units of work or a framework for planning the curriculum. It is likely that these ideas will already be used already in schools. The idea is not so much to reinvent the D&T curriculum content but more to use the specification to develop existing designs as well as come together to create new ones based on current practices. Then, teachers will be invited to share at a future workshop or conference their curriculum design ideas that meet this specification.

Whether these ideas will lead to an agreed solution is debatable (phase 4), it may be a resolution that teachers take and improve through practice and reflection in their schools.

5. CONCLUSION

New proposals emerging this year have been instigated by key organisations with an invested interest in the survival of D&T (e.g., Pearson's and D&TA). Our project differs in three ways: it is teacher led, the data collection and the data collected are freely available and the consultation process is allowing realistic time for teachers to reflect and share their views then debate with others. Our approach is building on Roberts' call for teachers-as-researchers, and we are taking a measured approach to the project. With seven iterations over 30 years that seem to have 'failed', we are reluctant to rush in with an untested solution. This is an embryonic projects and we anticipate that some of our design planning may go awry over the next 12 months, but with interest from the Department for Education and Dedign Council in our phase 2 work, we have motivation to keep the project on track.

We hope that the design ideas suggested by teachers will be seen as resolutions not solutions, the next iteration of D&T (akin to Spendlove's (2021) idea of design and/ or technology 2.0). We hope this project may help turnaround the juggernaut that is D&T.

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