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What do teachers of D&T think are the reasons for the decline of the subject in England?

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Abstract

This article discusses one part of the data from a larger research project that sought to identify factors that secondary school teachers of design and technology (D&T) in England felt may have contributed to the decline in entries at GCSE level within the subject. This study was designed to ensure the teacher's voice could be heard. Research was conducted in two parts, interviews and focus groups followed by an online survey, the first part provided qualitative and the second quantitative data. Questions within the online survey were informed by the qualitative data collection of part one. This article focuses on the findings from a specific question within part two of this data - the online survey. The factors indicated by the teachers within the survey are discussed in the findings section of this paper. The teachers' responses were organised into four categories: (1) macro level - external, national influences; (2) meso – school level; (3) micro – classroom influences, and (4) nano – individual level. Analysis of the teachers' responses indicated that the most noteworthy factor was the English Baccalaureate (EBacc), a government-imposed performance measure and influences from parents, the first at the macro level the second on the nano level. The least noteworthy factor was that more suitable examinations were available for upper secondary school pupils. It is hoped that this research will prompt professional dialogue regarding the decline of D&T entries at a macro, meso, micro and nano level and that subsequent action can be considered. Although conducted within England, this research prompts critical thinking that may help review educational practice internationally.

Keywords

Design and Technology, Teacher Preparation, Continued Professional Development, Decline, England

Introduction

The total number of entries into the Design and Technology (D&T) GCSE[i] within England has continuously declined since 2003. There is an exception in 2014 when there was a marginal increase in entries (JCQ, 2021a). Figure 1 shows that D&T has had the most significant decline in entries compared to other subjects, despite a rise in the total number of entries for all full GCSE courses.

As a teacher and head of D&T in a secondary school, this data confirmed the lead author's experience within their school that there was a decline of entries to the GCSE in the subject. Consequently, she decided to embark on this research project to understand the reasons for this decline.

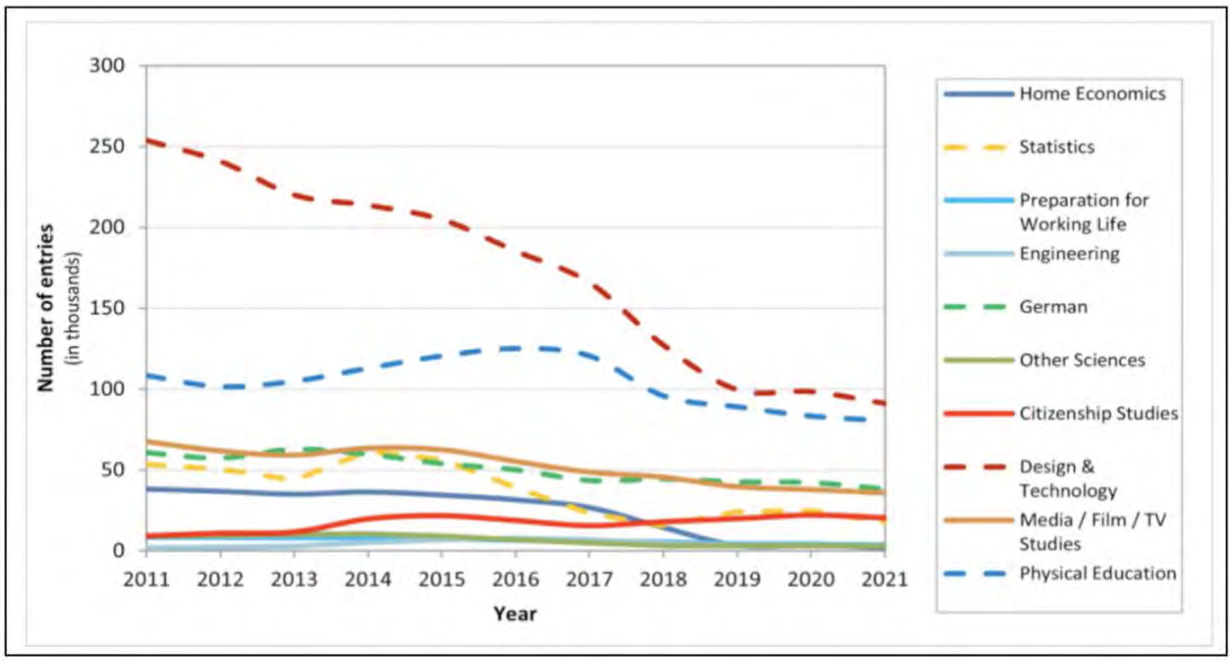

Figure 1 GCSE courses with a decrease in entries (JCQ CIC, 2021b)

Literature Review

A review of relevant literature was undertaken to identify previously discussed factors that may have led to the decline in GCSE entries of D&T. Two papers were seen as key: Miller (2011) *What's wrong with D&T?* and McGimpsey (2011) *A Review of Literature on Design Education in the National Curriculum.* Both papers were commissioned by the Royal Society of Arts (RSA). In paper one, Miller reflects upon his personal and professional experiences as a student and later as a lecturer. In the second paper, McGimpsey (2011, p.1) reviews literature to "understand the development and current state of design and technology". Between them, Miller and McGimpsey discuss several factors that may have contributed to a poor perception of D&T. They suggest that a poor perception of D&T has led to the subject's omission from the English Baccalaureate (EBacc)[ii] and anticipated that D&T would be further marginalised by its omission from the EBacc. Whilst this paper acknowledges that the EBacc may have encouraged D&T's further decline the data discussed in the introduction confirms that the EBacc cannot be regarded as the sole cause. Although, Miller and McGimpsey's papers do not aim to discuss the decline in D&T GCSE entries directly, it was decided that their analysis of D&T, although in 2011, was a useful frame for this study.

The factors that were identified during the search for literature are considered on a macro, meso, micro and nano basis. The definition of each is explained in turn.

Macro

Macro factors refer to external influences at national level, including government policies, advice from associations (e.g., the Design and Technology Association and Royal Academy of Engineers), and regulations set by examination bodies. The EBacc is an example of a factor at macro level.

In 2011, both Miller and McGimpsey suggested that the removal of D&T as a compulsory subject led to the decline in status of D&T. McGimpsey also suggests that the inclusion of technology in the STEM acronym, but no inclusion of design has led to a poor perception of the subject, with technology seen as being of greater importance than design.

Miller (2011) argues that the poor perception of the subject partly lies at macro level. He argues that D&T had an excellent opportunity when it was first introduced to the national curriculum in England, however the subject failed to achieve success. He claims that a reason for this are the perceptions of people outside the classroom, for example designers, policy writers and higher education academics such as himself. Miller's view is that these people take a view of D&T based on their understanding of what happens in the classroom. For example, when reflecting on his experience as a higher education admissions tutor: "In interviewing applicants for design courses, I have struggled to see the individual student emerge from the portfolio of DT [sic] project work-by numbers" (Miller, 2011, p. 7). Despite implying that the issue lies not with the macro level but with what is happening in the classroom, our view is that Miller is arguing that it is how those who have influence at the macro level, perceive what is happening in classrooms that shaped the development of D&T.

Miller also concedes that the vast curriculum is problematic. Reflecting on this, Stables (2012) wonders if the curriculum is prioritising the right things. In 2011, Miller suggested that the subject is too focused on technical content and manufacturing techniques, implying that he perceived these was an imbalance in the curriculum away from creativity. Analysis of the most recent English National Curriculum (Gov, 2013) shows that the word 'design' appears more often than the word 'technology'. This suggests that this is how the National Curriculum is interpreted by school D&T departments, with more focus on technical content and manufacturing techniques than the National Curriculum content details. Fahram et al (2018) describe how teachers tend to spend less time on content that they themselves have not mastered, which could account for the differences in curriculum within different settings.

Miller suggests that there is a lack of professional design experience and training amongst teachers, which means the design element of D&T has been neglected, and a lack of support was identified during the introduction of the subject (National Curriculum Council,1992). Although Jones et al (2019) identified that D&T teachers are more likely to have a Bachelor of Arts (BA) degree, rather than a Bachelor of Science (BSc). Taking a broad view of the differences between these two types of degree, this undermines Miller's view, but it cannot be assumed that an BA includes a greater focus on design than a BSc. Jones et al. (2019) found that teachers who held an arts background, rather than a technology background, lacked a broad understanding of technology and were unaware of their own deficiencies. This contrasts with Irving-Bell (2022) who found that teachers were aware of gaps within their subject knowledge, but she noted that a consequence of this awareness led to self-sabotaging behaviors such as anxiety and low self-esteem. With only 82.5% of teachers within the subject holding a post A-Level qualification relevant to D&T as a subject specialism (National Statistics, 2020a), a lack of specialists could be considered as an additional factor contributing to the decline of D&T.

Recruitment for teachers specialising in D&T at secondary education has been an issue for some time (Klassen et al., 2021). Despite a surge in applications for teacher training following the COVID-19 pandemic, recruitment is expected to remain challenging (Worth and Faulkner-

Ellis, 2021). In 2020, only 75% of the recruitment target for trainees within the subject was reached (National Statistics, 2020b). This was despite D&T being the only subject to have had their recruitment target decreased by 10%, after failing to achieve previous recruitment targets. Recruitment for beginner teachers within England is struggling and despite bursaries for trainees within the subject, only 25% of the recruitment target was met within England during the 2022/2023 academic year (Gov.uk, 2023a). Within England during the academic year 2022-2023, D&T was taught for 71.3% of the hours by teachers who did not hold a relevant post A-level within the subject (Gov.uk, 2023b).

McFarlane (2021) proposes that the struggle to recruit specialist D&T teachers can be attributed to the diversity of the subject. In other words, the range of materials, processes, and techniques a D&T teacher might have to teach, some of which may be beyond their previous learning from their school and university education.

Macro decisions have implications for decisions made at school level, which are discussed in the next section.

Meso

Both Miller (2011) and McGimpsey (2011) anticipated that a consequence of D&T's omission from the EBacc would be a reduction in the time and resources allocated to the subject within a school – the meso level. From our experience this consequence is still relevant, with teaching time reduced for D&T to give more time to the teaching of the Ebacc subjects. The significance of the EBacc as a performance measure for schools may have an impact on the qualifications offered to pupils aged 14-16 years old (those in upper secondary school). Using a case-study approach, Abrahams (2018) found that the subjects offered to pupils were done so strategically. Hardy's (2015) analysis of why the number of pupils studying GCSE has declined suggests that a school leader may fail to offer D&T to pupils if the subject has historically performed less well than other subjects. By offering higher performing subjects, the school are more likely to rank higher in national league tables, which are used to hold schools accountable (Lilliedahl, 2023).

Gaotlhobogwe (2012) found that pupils will enjoy D&T less and their achievement will suffer, if time, resources, and funding are cut. This could lead to a poorer perception of D&T, as the pupils will not feel as fulfilled by the subject and are likely to also voice these opinions to others, such as their parents. This could have an adverse effect on the subject's reputation.

Miller suggests that D&T departments can be isolated within the school because of the specialist classrooms that D&T require. Hardy (2021) argues that decisions made relating to the location and presentation of D&T can present implicit messages about the value of the subject. For example, D&T rooms are often at the back of the school for practical, logistical reasons but this means they are hidden away. Other examples include the images used to portray D&T (see the pictures used within Miller's paper, e.g., hands saws and frying pans), the clothes teachers wear (white lab coats and aprons) and requesting monetary contributions from parents.

Returning to the issue of time and resources, an ongoing challenge has been teaching pupils the full content of the national curriculum with limited time and resources. Since its inception, many schools organise the teaching of D&T as a series of rotations between material areas (e.g., six weeks designing and making with textiles, then moving onto plastics, electronics and

so on). However, this structure restricts teachers from providing a progressively challenging curriculum and leads to a repertoire of low quality of skills and knowledge across various materials (Davies and Steeg, 2005; Choulerton, 2016). This style of curriculum organisation may influence how pupils and parents perceive D&T.

Micro

Micro factors refer to influences at classroom level. Miller's (2011) perception of the school context is based on his experiences of working with pre- and in-service teachers, plus qualitative data collected from young people interested in D&T. He focuses on three aspects at the micro level: what is taught, how it is taught, and who it is taught by. Miller's analysis of how the subject is taught within the classroom is the most extensive, suggesting that he perceives the subject as most significantly impacted on a micro level.

The teacher is the most important factor within the classroom (Hattie, 2003) and is key in shaping how the subject is taught and received (Hardy 2015). Similarly, Wooff (2017) claims that the implementation of D&T continues to be influenced by individual interpretation of teachers, which may impact how the subject is structured and delivered within classrooms. Miller (2011) suggests that the subject is taught with a formulaic structure, which limits the creative input of pupils, something which has been previously reported in the early years of the D&T National Curriculum by McCormick, Murphy and Davidson (1994) and McCormick and Davidson (1996). Such structure discourages deep thought, reflection, and analysis (Williams 2000).

In 2008 and 2011, Ofsted reported on D&T identifying, amongst other issues, that not all D&T teachers have updated their subject knowledge, plus many lack expertise across material areas. Consequently, limiting pupil experience within the classroom. McGimpsey (2011) suggested that the diverse demands of subject knowledge are challenging for a single D&T teacher to meet within their curriculum (for example, rather than being an expert in a single material D&T teachers might be expected to teach across two or more material areas). This is like Miller's view that the diverse curriculum affects recruitment at a macro level, whereas here McGimpsey's focus, like Ofsted's, is on what is happening in the classroom. This is an example of where a macro decision – that is the National Curriculum content, influences more than one level.

However, it must be noted that Davies (2022) refutes the claims from Miller (2011) and McGimpsey (2011) that teachers are to blame for the failure of the subject and concludes that the situation is more complex than the factors on the micro level.

Nano

Finally, the nano level, where factors are influenced by individual choices or action. Here we focus on pupils and their parents. As noted above, how a teacher interprets a curriculum may differ from what is intended. Similarly, pupils may perceive what is taught in unintended ways (Maw, 1993). Pupils' engagement with a subject can be influenced by how meaningful it is to them (Priniski, Hecht & Harackiewicz 2018). If their teacher's interpretation of D&T does not align with the views of the pupils, then this may affect their engagement and achievement in D&T (Hardy 2017).

This returns us to the hidden curriculum which was discussed within the meso section of this literature review. We can apply this theory here and consider that it is because such unintended symbolism may be perceived in different ways and may influence pupil perceptions, either consciously or subconsciously, of what constitutes as social norms within the subject. Notably, the notion of a hidden curriculum has been considered as a reason for a perceived gender divide within the subject (Sultan et al., 2018; OECD, 2015; Harding, 2009).

According to Miller (2011), pupils perceive subject content as hard and felt that the examination coursework required a large volume of work. In addition, McGimpsey (2011) identified that the subject is not favoured by high-attaining students. This is contrasts with the findings of Bell et al. (2015) who collected data from pupils aged 11-14, and found pupils thought D&T was too easy and felt that pupils did not need to be clever to study this subject. Either of these views will affect whether a pupil, and their parent, view D&T as a suitable post-14 subject to study that leads to a qualification (Eccles & Wigfield, 2002).

Literature Review Conclusions.

Decisions made at macro level, in practice influences decisions made at school level, classroom level and on an individual level. For example, on school level subject allocation, such as the number of hours taught and the number of teachers within a subject may be affected. At classroom level, the core knowledge that is taught may be changed and at nano level the perception of the subject may be influenced by an omission. It is worth noting that since the initial literature review, further items have been published which discuss the decline of D&T (e.g., Spendlove, 2022) and the future of D&T education (Pearson, 2023; Halliwell et al, 2023; Design and Technology Association, 2023).

Research Question

This paper aims to answer this question:

- How has the decline in D&T been impacted by decisions made at a national, local, classroom and individual level?

Within this research, these four levels are described as (1) macro - national governance level; (2) meso refers to the subject at a school level; (3) micro - classroom level and (4) nano refers to an individual, such as the pupil or their parents.

Methodology

Following the literature review, research was conducted to investigate the opinions of teachers. This study was designed to ensure the teacher's voice could be heard. Participants provided valuable insights into their experiences as a teacher of D&T and their journey to becoming one. An interpretative approach was undertaken throughout this research. It is important to note that an interpretative approach does not claim to provide a definitive answer to the research questions, as one will never be able to fully understand the experiences of another (Palmer, 1969). Instead, an interpretive approach is based on the author's interpretation of the participants' lived experiences data analysis (Dibley et al., 2020). For this study, that meant the authors interpreted the D&T teachers' responses to help mitigate against a further decline of D&T.

This article discusses one part of the data from a larger research project, that sought to identify factors that secondary school teachers of design and technology (D&T) in England felt may have contributed to the decline in entries at GCSE level within the subject. For the larger study, several methods of participation were offered to encourage the involvement of teachers who often feel that their workload is excessive (Jerrim et al., 2021). Data collection included an online survey, asynchronous focus group, synchronous focus group and semi-structured interviews, which ran concurrently. Such data collection methods enabled data to be triangulated to strengthen the validity of the research. Participants could opt for the data collection with which they felt most comfortable. Data was collected iteratively and analysed, through coding, in to guide subsequent data collection. Quantitative approaches were utilised within the online survey, which could support or contrast the qualitative data collected through the asynchronous forum, synchronous focus group and semi-structured interviews.

Research Methods

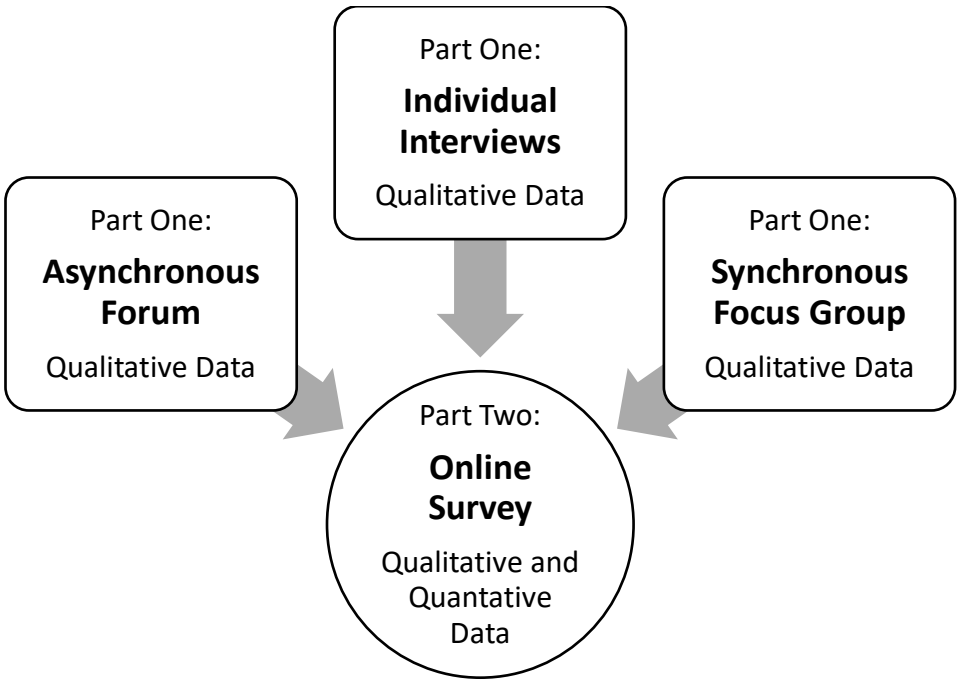

Figure 2: Methods of data collection

This study collected data in two parts. Only qualitative data was collected in Part One. This data was used to inform the creation of an online survey, which was used as the tool for data collection in Part Two. During Part Two, both quantitative and qualitative data were collected. A mixed method of data collection was used for the following reasons:

- To ensure teachers could contribute to the study in their preferred way.
- To provide further breadth and depth to the data than may have been possible by using just one method of data generation (Bello, 2021).
- To ensure a rigorous study was undertaken, methodological triangulation was used (Flick, 2018). This was important, as the nature of the data that was collected is

subjective, and therefore individually the reliability and validity of this data can be questioned (Burns, 2000).

Recruitment

The recruitment of participants was essential to the validity of the project. Recruitment was largely undertaken through social media to align with the data collection planned to be conducted virtually. Posts were made on several D&T community Facebook groups. During this phase of the project, it was identified that particular age groups participate within social media platforms in differing ways (Brandtzaeg and Chaparro Dominguez, 2018); in other words, if participants were only recruited via Facebook there was likely to be a narrow age range of teachers who responded. Therefore, to overcome this, 'snowballing' was encouraged (Gibson, 2017). Fifty schools selected at random, were sent invitations through the post. However, this had no effect, and it is noted that all participants have been recruited via social media which potentially limits the types of teachers participating within the project.

Initial Sampling

Participants were required to be:

- a qualified teacher
- having taught D&T in a secondary school for at least one full academic year within England since September 2020, on either a part-time or full-time basis.

Consideration was given to focusing upon teachers from within specific material specialism. However, at this stage this was deemed restrictive, potentially weakening the data collection, and not allowing the data to portray the diversity of thought that could be uncovered amongst teachers of contrasting material areas. Participant consent was gained through an online form, and participants were asked to confirm that they met the sampling criteria. Except where doubts were held during the data collection, no further checks were made to clarify the credentials of individuals. Where checks were made, and individuals were not found to meet the initial sampling criterion the data they contributed was withdrawn from the analysis.

Data Generation

In line with the iterative approach that was at the heart of the research project, an openness was maintained, that was responsive to the constant generation and analysis of data and allowed flexibility to act upon new or unexpected lines of enquiry. A decision was made to collect all data virtually, such as through video calls and written word. Conducted during a time of uncertainty, this ensured that data collection could continue despite COVID-19 restrictions that may have been unexpectedly enforced. Equally, an advantage of collecting data this way, was that it allowed participation from teachers who were located within different areas of England or located elsewhere (assuming they fulfilled the initial criterion). As the research was conducted online, it was important to reduce technical issues, which would have had a negative impact upon the generation of data and could have led to disengagement amongst participants. A private Facebook group was used as the platform for the asynchronous focus group,' Zoom' was used for the semi-structured and synchronous focus group, and 'Survey King' was used for the online survey. These platforms were chosen due to their perceived reliability and the functions that they offered. It was important to ensure that the platforms could be accessed

using a variety of devices, including smartphones, which are the most used device to access the internet (O'Dea, 2020).

The next section describes part one and part two of the data collection.

Part One: Asynchronous Forum, Individual Interviews and Focus Group

The role of the teacher is central to the subject and except for students themselves, teachers have the highest impact on pupil progress amongst other influences such as their home, peers and the school they attend (Hattie, 2003). Yet, within the literature review their voice on 'the decline within D&T' was missing. Several methods of participation were offered to encourage the involvement of teachers, who often feel that their workload is excessive (Jerrim et al., 2021). The first method of data collection was an asynchronous forum, which was hosted on a private 'Facebook' group. Social media offers a platform that enables interactions with others that fits into the participants' busy lives (Dhanalakshmi et al., 2017). Participants could self-manage how much time they spent participating in the group and when they participated. Williams et al. (2012) claim that 'asynchronous' platforms often see participant responses that are more carefully considered and reflective than traditional synchronous focus groups. Two additional methods of data collection were used in part one, as it was acknowledged that without face-to-face contact, participants are more likely to withdraw from research (Reips, 2000). Semi-structured interviews and a synchronous focus group were held virtually as video calls.

Part One: Participants

Table 1 shows the number of participants within each method of data collection during part one. Some participants took part in more than one method.

Table 1: Part One Participants

	Asynchronous Forum	Individual Interviews	Focus Group
Number of participants	21	7	3

Part One: Findings

The data from Part One was used to inform the Part Two data collection. Twenty-six factors for the decline in entries were identified.

Part Two Data Collection

Part Two of the data collection was an online survey, which was informed by the data collection of Part One. The survey was divided into five sections:

1. About you (Your current role, previous experience, and teacher training).
2. Your thoughts, feelings, and perspectives about D&T.
3. Key Stage 3 curriculum (lower secondary school, pupils aged 11-14 years old)
4. Key Stage 4 curriculum (upper secondary school, pupils aged 14-16 years old, where pupils typically study for General Certificate of Education (GCSE) qualifications.
5. Continued Professional Development

In this paper, we are reporting on one question from the second section: 'Your thoughts, feelings, and perspectives about D&T': "Reflecting on your experiences, which of the following factors do you feel have impacted on the decline in entries to GCSE D&T?" Participants were able to select as many factors as they felt appropriate.

Part Two – Participants

Twelve respondents to the survey met the sampling criteria and were included in the final data set. Eight of these respondents were the Head of the D&T department within their setting and four were classroom teachers. All had been teaching for at least seven years, six had been teaching for more than 15 years. Except one participant, all had completed their initial teaching training in D&T; the exception was trained as an art and design teacher.

Table 2: Part Two Participants

Number of participants	12
Note	some members may have also participated within the data collection of part one.

In the next section, the findings are shown and analysed. This is then followed by a discussion.

Findings and analysis

The first step involved categorising the factors into the levels (Columns macro, meso, micro and nano in Table 3). Using the literature review and our analysis of the 26 factors, eighteen factors were categorised as influencing at only one level, four at two levels, two at three levels and two at all four levels (Historic/Outdated perceptions of what D&T is or should be). Thirteen factors were categorised macro, eleven meso, eight micro and eight nano. Factors identified from Part One, were where teachers gave qualitive responses to the question 'What do you think impacted on the decline of D&T?'. It's interesting to note that of the 26 factors, most were categorised as being outside the participants' direct control – those at the macro level, whilst the next most common category, the meso level, is where teachers have some control and influence. We acknowledge that this categorisation is subjective, and others may apply the levels differently.

The next step involved analysing the responses against each factor by the total number of participants (see the last three columns and the row 'Total number of responses for each level' in Table 3 and all of Table 4). The Ebacc and influence from parents were the most selected factors (n=8). No factor was selected by all the participants (Table 4), but this might be due to the small sample size and the large list of factors, so the likelihood of agreement diminishes. Four factors were only selected by one participant:

1. Belief that the GCSE is too hard (nano).
2. Primary school experiences of D&T (meso and micro).
3. Disparity in how D&T is taught (meso and micro).
4. Gender bias (micro and nano).

The order of the total number of responses for each level matches the order of the number of factors for each level: macro, meso, micro and nano. This implies that the macro and meso factors were seen as having a greater influence on the decline of D&T GCSE numbers than the micro and nano. This is explored in the Discussion.

Finally, the data was analysed and compared by the teachers' role: head of department and class teacher. All four teachers selected two factors: Ebacc and lack of funding. The heads of department did not all agree on any single factor (Table 4); the most common factor was influence from parents. There was one factor the teachers did not select, that was selected by the heads of department: belief that D&T GCSE is too hard. This compares with four factors not selected by the heads of department but selected by the teachers:

1. Too many/or unsupported changes to the subject (macro).
2. Primary experiences within D&T (meso)
3. Disparity in how D&T is taught (meso and micro)
4. Gender Bias (micro and nano).

There appears to be no pattern between the levels of these four factors. It might be that because most of the participants were heads of department, who as part of their role interact more with school leaders and managers that they are more aware of these factors. It is difficult to make any meaningful comparison between the responses by the two groups (head of department and classroom teacher) because the sample size is small (n=8; n=4). However, it can be commented on where there is a noticeable disparity or similarity.

More of the teachers (75%) selected lack of support from official bodies (macro) than the heads of department (12.5%). This disparity was the same for five other factors (see Table 3). There was no disparity in reverse for any factor; in other words, there were no noticeably higher percentage of the heads of department selecting a factor compared to the teachers.

Ten factors were selected once by both groups (Table 4), suggesting a lack of consensus amongst the participants, which is unsurprising given the number of factors listed in the survey compared to the sample size.

Table 3 Factors, levels, and responses to the survey

Factor	Macro (Gov)	Meso (School)	Micro (Classroom)	Nano (Individuals)	Teachers (n=4)	Heads of department (n=8)	Total (n=12)
EBacc					4	4	8
National Curriculum is ill-fitting					2	2	4
Lack of support and engagement from official bodies					3	1	4
Lack of requirement of D&T GCSE at further/higher education					2	2	4
GCSE specification is too broad or too narrow					1	2	3

Too many/or unsupported changes to the subject					2	0	2
Suitability of GCSE specification for 14–16-year-olds					1	1	2
Maths and science content with GCSE specification					1	1	2
Post-14 option blocks					3	4	7
Lack of lower secondary teaching time					3	1	4
Timetabling					1	2	3
Influence from other school staff					2	2	4
Resistance to change from D&T teachers					1	1	2
Primary experiences within D&T					1	0	1
Influence from parents					3	5	8
Belief that the D&T GCSE is too easy					3	1	4
Peer pressure to choose other subjects					1	2	3
Belief that the D&T GCSE is too hard					0	1	1
Lack of funding/tools and equipment					4	1	5
Lower secondary experiences within D&T					3	3	6
Disparity between teachers in the way D&T is delivered within settings					1	0	1
Lack of skilled teachers					3	2	5
Disparity between teachers in the perception of what D&T is or should be					3	1	4
Gender Bias					1	0	1
Amount of theory that is required to be studied					1	3	4
Historic/Outdated perceptions of what D&T is or should be					3	1	4
Count of factors per level	13	11	8	7			
Total number of responses for each level	51	47	27	26			
Average					2.0	1.7	3.7

Table 4 Count of the factors selected.

Number of factors	Teachers	Heads of department	Total
0	1	4	0
1	10	10	4
2	4	7	4
3	9	2	3
4	2	2	9
5	N/A	1	2
6	N/A	0	1
7	N/A	0	1
8	N/A	0	2

Discussion

In this section we discussed how our data analysis compares with the factors identified in the literature. Within each sub-section we explored why some factors seem to rank higher than others in the participants' perception, as impacting on the decline of D&T.

It should be remembered at this point that the survey's 26 factors came from analysis of the data in Part One; so some factors mentioned in the literature are excluded because they were not listed in the survey. Therefore, we cannot assume that there is an issue if a factor is mentioned in the literature but not in the data for Part Two.

The notable factors omitted from the survey included imbalance of curriculum content (technical versus design) (Miller, 2011), teacher recruitment (Klassen et al., 2021; McFarlane, 2021), professional development and training (Miller, 2021), and the formulaic structure of design activity (McCormick, Murphy and Davidson, 1994; McCormick and Davidson, 1996; Miller, 2011).

Macro

The Ebacc was the most selected factor in our data, as was mentioned specifically by both McGimpsey and Miller (2011). However, in our study the participants did not go back to 2004 when D&T was removed as a compulsory subject, as it was not included as a factor from the data analysis of Part One. Both our data and the Literature comments on the curriculum content as a factor in the subject's decline. Although, the brevity of the factor in the survey means it is difficult to state that the concerns are similar. The literature focuses on the National Curriculum whilst the survey asks about the GCSE content and whether the National Curriculum was ill-fitting.

Whilst teacher recruitment and professional development were not explicit in the survey's factors, they are hinted at in four factors: (1) too many or unsupported changes to the subject; (2) disparity between teachers in the perception of what D&T is or should be; (3) Lack of skilled teachers, and (4) disparity between teachers in the way D&T is delivered within settings. There was also the idea that there is little or no direction from national bodies about how to adapt current practices to new curriculum content. This lack leads to differences in classrooms and within departments that cause confusion for the pupils and conflict amongst colleagues. Neither outcome produces a positive perception of D&T, instead it leaves outsiders, like pupils, parents, and school senior leaders even more confused about the purpose and value of D&T.

It was suggested that Miller's (2011) view, that the poor perception of the subject by more distant outsiders (for example, higher education design lecturers), was the reason for the participants' view that the lack of requirement of D&T GCSE for further or higher education courses undermined the status of the subject.

Meso

At the school level, the reduction in teaching time and resources were factors in our data but they were less so, than the impact of whether the subject is made available for pupils to study post-14 (Hardy 2015, Abrahams, 2018). In our survey, the factor was specifically about pre-14 teaching time, whereas in the Literature Review the focus is on post-14 time. Anecdotally, we know of several schools where teaching time for D&T is reduced in Key Stage 3 (11-14 year-

olds) due to teacher recruitment, funding and increasing time given for English and mathematics. It seems obvious to say this, but it will have an implication on the number of pupils studying GCSE D&T (the focus of our research question). Particularly if teachers feel there is too much subject content to be covered in the time available, resulting in pupils not being prepared for post-14 study, as they have had insufficient time in the first three years of secondary school. We have noticed that more teaching time is now spent on 'theory' in D&T rather than on directly engaging in a design project, where pupils can actively develop their design capability (Stables 2012).

A new factor was the influence of other staff (i.e., non-D&T teachers or support staff). This suggests to us that this group have a poor or confused perception of D&T and struggle to encourage pupils to study D&T post-14.

Micro

Miller (2011) and Wooff (2017) identified teachers' individual interpretation of D&T as having an influence on its implementation which in turn impacts on pupils' engagement with the subject (Hardy 2017). This view is reflected in our analysis in a few factors, including 'resistance to change from D&T teachers' and disparities between teachers in how they teach and perceive the subject. Although, there are eight factors identified at this level and the literature talks about the impact the teacher has on pupils, the responses suggest that the participants do not see this level as where there is the greatest impact on the subject's decline.

This suggests the participants perceive they have less influence on the subject than national or local actions. We wondered if this was because teachers feel they have less agency over what they teach and how they teach it (Connolly and Hughes-Stanton, 2020), and so see fewer possibilities of control over the decline as existing within their classrooms.

Nano

Only one participant thought the perceived gender bias within D&T was a factor in the subject's decline, which may be seen as surprising given the extensive research conducted and reported on in this area (Sultan et al., 2018; OECD, 2015; Harding, 2009). However, this research tends to focus more on how females are excluded, often unintentionally, from the subject, not on the consequence of this exclusion on the status or nature of the subject.

Parents influence on pupils' choices and engagement was a significant factor for the participants but in our literature search was a more minor factor. We think this area warrants further research as it is deemed to be so significant to teachers, albeit a small sample.

Conclusions

We set out to answer the question 'How has the decline in D&T been impacted by decisions made at a national, local, classroom and individual level?' with responses and perceptions from practicing D&T teachers. As we set out in the methodology section, this study was designed to ensure the teacher's voice could be heard. We used Miller's and McGimpsey's papers from 2011 to frame the literature review. We recognise these are dated sources, but it has been interesting to see how many of their observations resonate with the teachers' responses in our data. So, in answer to our question, our analysis has shown that, according to our participants, there are many factors impacting on D&T's decline. Most are at national and local level, which

some teachers may see as being beyond their control or influence to rectify. Factors at a classroom and individual level were also identified but not as many as those at the national and local level. The most selected factors were the 'Ebacc' and 'parents' influence', notably these are at opposite ends of the spectrum outside of a teacher's sphere of control or influence. There were differences between the two groups of teachers who participated: classroom teachers and heads of department. Whilst both groups agreed about the Ebacc and parents' influence, the teachers also thought lack of funding was having a negative impact on D&T.

One recurring theme from the literature and our analysis is the need for professional development, not only for 'subject knowledge' but also for 'curriculum organisation' and 'debating the nature of the subject'. If teachers go through these three types of professional development, then we think this could have a positive effect on the perception of the subject. In the first case, teachers could experience new equipment and techniques within their subject area by completing industry-related experience, as the Design and Technology Association currently offers through their 'BluePrint1000' programme. In the second, supporting teachers in planning curriculum changes, using an action research model would give more confidence to others outside D&T, as they could see how the teachers have tried and evaluated their ideas following a set structure. This idea would build on Roberts' (2001) call to support teachers-as-researcher. Similarly, Halliwell et al. (2023) have recently reported on a D&T teacher-led project developing D&T curriculum ideas between teachers. These can happen more informally with local network groups or teachers who connect via social media. Davies (2022) identified this 'ground-up solution' in her work. Supporting this type of low-cost solution may encourage teachers to become inspired, learn new knowledge from each other to build a supportive, local community. Although low in financial cost, there could be cost to schools including release from lessons, however the return on this low investment could lead to retaining more knowledgeable teachers.

Recommendations

We are not claiming that these three solutions would stop or reverse the decline of D&T, but they are solutions which address three of the four levels discussed in this paper. The fourth level (nano), with parent and pupils, is under-researched and we think future studies exploring the origins of parents' and pupils' views of D&T and how these influence their view of the subject would be useful. Eccles & Wigfield's (2002) expectancy-value theory, combined with Hardy's Subject Values Instrument for Design and Technology Education (SVA-D&T) (Hardy et al., 2022), could be a good starting point for such a study. We recognise that action needs to happen at each of the identified levels, as they are factors identified in this paper that have contributed to the subject's decline.

Further investigation into teachers' perceptions will contribute to the research on D&T education within England, which is currently limited. Although centered specifically upon teachers of D&T within England, it is hoped that the findings and recommendations from this research prompt professional dialogue and review to instigate change in education beyond this context. This research was designed to acknowledge the importance of the 'teacher' and reinforce that their voice must be listened to for positive changes to be made.

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[i] GCSE: General Certificate of Secondary Education, a qualification studied by pupils in upper secondary and examined in their final year of secondary school, typically when they are aged 16.

[ii] According to the Department of Education (2019) "The EBacc is a set of subjects at GCSE that keeps young people's options open for further study and future careers. The EBacc is:

- English language and literature
- mathematics
- the sciences
- geography or history
- a language"

D&T is not included in the EBacc.