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McLain, M, Schillaci-Rowland, D, Stables, K and Hardy, A

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Design and Technology Educators' Experiences of Competence, Relatedness and Autonomy with Educational Research

Matt McLain, Liverpool John Moores University, UK

Daniela Schillaci-Rowland, Presdales School, UK

Kay Stables, Goldsmiths, University of London, UK

Alison Hardy, Nottingham Trent University, UK

Abstract

This article reports on the results of a survey of Design and Technology educators, predominantly based in England that sought evidence of the extent to which the educators engaged with educational research more generally and also specifically within Design and Technology Education. The survey was sponsored by the professional Association of Design and Technology Education and was undertaken by its Design and Technology Research Steering Group. The survey collected demographic data on the roles and responsibilities of the survey respondents, the types and levels of education where they worked and length of experience in Design and Technology education. Questions explored the types of research of interest, confidence levels in accessing, using and undertaking research, the nature of support for engaging research that educators would welcome, how research was currently accessed, what the challenges and barriers might be and what would motivate educators to become more engaged with research. This article resorts on analysis of the data, drawing on Self Determination Theory and specifically concepts of competence, relatedness and autonomy. Findings indicated that respondents had a great deal of interest in principle, but that there were considerable barriers to engaging with research which impacted on competence, relatedness and autonomy. The insights provided will now be used as the basis for developing support for Design and Technology practitioners to engage with research at a variety of levels.

Keywords

Autonomy, Competence, Design & Technology, Relatedness, Research, Self Determination Theory

Introduction

There has been growing interest in schools in England in educational research and evidence-informed practice in recent years. As with many changes in the national landscape, there is a policy drive behind this change, with the associated focus by schools on approaches that are overtly or subconsciously sanctioned by the power brokers, such as the Department for Education (DfE, 2017, 2013) the government department responsible for schools and curriculum, and the Office for Standards in Education (Ofsted, 2020) the inspectorate for schools in England. The current trend is for cognitive science and randomised controlled trial research, promoted by the Educational Endowment Fund (EEF, 2023; Impetus, 2023), established with a £125 million grant from the DfE in 2011 (Impetus, 2023). However, the jury is still out on the current fixation on research from the cognitive sciences, regarding its efficacy in

real-world education practice – i.e., classrooms, workshops, labs, etc. – even from its proponents (Perry et al., 2021; Perry, 2022).

Irrespective of whether or not one agrees with the narrow focus promoted in schools in England, there are three key assumptions made by policy makers; first that teachers want and see the benefit to being more research informed, second that they have ready access to relevant and high-quality research findings, and third, that they are able to effectively engage with and apply research in their classrooms.

This study explored these assumptions, investigating Design and Technology (D&T) educators' engagement with educational research, past, present, and future, including initial teacher education, postgraduate studies and school-based inquiry. Participants were invited to respond to a survey by the Design & Technology Association (D&TA) research steering group (DTRSG), underpinned by three research questions that guided the study:

- **RQ1.** To what extent are teachers of D&T currently engaged with educational research?
- **RQ2.** Is there interest in the development of support from the D&T Association for educational research?
- **RQ3.** Where should the D&T Association prioritise educational research?

The DTRSG was established in 2021, when this survey was launched and this paper builds on an initial analysis of findings from the questionnaire at the Pupils' Attitudes Towards Technology (PATT39) in 2022 (McLain et al., 2022), which focused on four survey questions.

The majority of participants identified themselves as curriculum leaders (56.0%) and qualified teachers (35.0%), accounting for 72.6% of the responses – note that participants could select multiple roles and we assume that curriculum leaders are also qualified teachers (Table 1).

Table 1 Current Role in D&T

Role	Main n (%)	Multiple n (%)
Middle Leader	139 (50.2%)	155 (56.0%)
Qualified Teacher	62 (22.4%)	97 (35.0%)
Senior Leader	27 (9.7%)	31 (11.2%)
Teacher Educator	15 (5.4%)	28 (10.1%)
Educational Consultant	11 (4.0%)	15 (5.4%)
Student Teacher	5 (1.8%)	5 (1.8%)
Retired	4 (1.4%)	4 (1.4%)
Educational Researcher	2 (0.7%)	10 (3.6%)
Early Career Teacher	1 (0.4%)	1 (0.4%)
Unqualified Teacher	1 (0.4%)	1 (0.4%)
Technician	7 (2.5%)	7 (2.5%)
Other	3 (1.1%)	2 (0.7%)

62.9% of the participants were involved with secondary D&T education and 20.2% with primary (Table 2). Participants were able to identify multiple options for their current role(s), with educators working as consultants, teachers and researchers. Most respondents trained in England (89.9%), with minor representation from Northern Ireland (0.4%), Scotland (1.1%), Wales (3.6%) and others (5.1%) - including Australia (0.4%), India (0.4%), Nigeria (0.4%),

Republic of Ireland (0.8%), and Zimbabwe (0.4%). Of the teachers working in schools, the majority worked in Academy or Free Schools (42.2%) and Local Authority Maintained schools (26.0%); with representation from Fee Paying (15.9%) and Grammar (3.2%) school settings.

Table 2 Representation from the Education Phases

Phase	Number n (%)
Early Years	11 (3.1%)
Primary	72 (20.2%)
Middle	3 (0.8%)
Secondary	224 (62.9%)
Special	3 (0.8%)
Further	22 (6.2%)
Higher	15 (4.2%)
Other	6 (1.7%)

Most responses came from qualified or trainee teachers, with almost two thirds (62.7%) being trained via a postgraduate route (Table 3). Half of participants (50.2%) indicated that they had completed a dissertation as part of their initial teacher education, with most of these (59.7%) focusing on D&T. Most participants (69.9%) had not completed a postgraduate qualification since qualifying to teach, with only 14.5% (n=12) undertaking a full Masters and 3.6% (n=3) a doctorate, indicating a limited number having engaged with formal, structured research since qualifying.

Almost half of the responses (48.4%) were from participants who were in service for up to 30 years (Table 3). As an overall percentage, participants with more than 5 years' service were more likely to be very interested in D&T research, with the strongest representation from the categories with 6-10 (71.4%), 11-15 (57.7%) and 16-20 (63.0%) years.

Table 3 Years In-Service

Years	Number n (%)
0-5	40 (14.4%)
6-10	35 (12.6%)
11-15	52 (18.8%)
16-20	46 (16.6%)
21-25	44 (15.9%)
26-30	36 (13.0%)
31-35	8 (2.9%)

Literature review

Stenhouse (1975), a foundational proponent of the idea of teachers-as-researchers, highlighted the gap between teachers' ideas, aspirations, and actions as the problem of evidence-informed practice, emphasising the need to acknowledge and investigate our failures. This approach espouses the view that good teaching is experimental and reaches for improvement (Rudduck & Hopkins, 1985), a far cry from the current focus on professional standards (DfE, 2011) and inspection frameworks (Ofsted, 2022) that take a performative stance towards teacher effectiveness. Nevertheless, this is the context that teachers in England find themselves in and, as mentioned earlier, there is also the DfE and Ofsted current focus on evidence-based practice. Therefore, it is important to build research capacity in the teaching workforce, not merely

providing access to appropriate research, but by equipping teachers with the knowledge to interpret and apply it (Cain 2019; Davis 2020).

There have been attempts in the recent history of education in England to encourage and facilitate teacher-researchers. The UK government funded the Best Practice Research Scholarship (BPRS) programme between 2000 and 2003 that was intended to build research capacity and engagement in schools (Furlong & Salisbury, 2005). Approximately 3000 scholarships were awarded to classroom teachers. However, Furlong and Salisbury's evaluation of a sample of teacher research, found that the emphasis of most projects was on improving practice in individual schools, rather than on knowledge generation and exchange. Therefore, the learnings from this potentially impactful initiative were somewhat limited to the local settings and serendipitous cross pollination of ideas. A lack of rigour and effective dissemination resulted in missed opportunities for the wider teaching communities to learn from the funded research. One of Furlong and Salisbury's recommendations was that a combination of mentoring, funding, and formal facilitation of research in schools would have a greater chance of success.

An example of this taking place has been described by Skogh and de Vries (2013), outlining a funded doctoral programme for teachers in Sweden. This study focused on the learnings from technology education teacher research. The programme aimed to bridge the gap between academia and schools. Themes emerging from the evaluation of this and similar projects emphasise the importance of collaboration, impact, mentoring and access. Collaboration is important both for planning and funding school-based research, and having a clear understanding of impact, including classroom practice and learners' attainment. There is a need for a supportive and purposeful community that engages teachers working together with experienced researchers in a symbiotic and robust mentee-mentor relationships. Finally, is fundamental importance that teacher-researchers have access to research findings (often hidden behind a paywall only accessible to HEIs) and the resources to facilitate sustained study to inform and improve classroom practice.

These findings resonate with the apparent intentions of the DfE for schools in England, with the exception of any direct reference to the role of HEIs in providing support and expertise. A recent White Paper states that there is "a rigorous commitment to using, building and sharing evidence so that every school knows 'what works' for all of their children; and a focus on enabling collaboration between teachers, schools and wider children's services" (DfE, 2022, p.8). As mentioned earlier, the current focus from the DfE and Ofsted is on educational research derived from cognitive science and randomised controlled trials. However, critics point out the limitations of these approaches to handle the complexities of human behaviour and volition, as well as being relatively unproven in real world contexts. The so-called 'what works' approach, whilst appearing on the surface to be pragmatic, could be incorrectly inferred to provide concrete answers to every classroom circumstance and underplay the importance of teacher experience and expertise, as well as a wider range of research methodologies (Biesta, 2010).

In order for teacher research to happen, teachers need to be given time and training to plan, do, analyse and share research (Herbert-Smith, 2022; Stremmel, 2007). The benefits of

becoming involved in research include a potential increase of reflectiveness and criticality in teaching, as well as openness, and commitment to professional development (Stemmel, 2007).

The next section explores the theoretical framework being used to analyse the findings presented.

Theoretical Framework

The findings of the questionnaire have been analysed using Self Determination Theory (SDT) (CSDT, 2023). SDT provides “a broad framework for the study of human motivation and personality” and is concerned with the experience of *competence*, *relatedness*, and *autonomy* by the individual. These three factors are argued to underpin intrinsic motivation and engagement, as well as promote “enhanced performance, persistence, and creativity” (see also Maslow, 1943, 1954). The findings have been analysed using these three core factors.

SDT considers human beings’ need for **competence** as one of the three basic psychological needs, and a motivating factor for the process of learning and engaging with our environment (Ryan & Deci, 2017). Associated with competence is a sense of ability to organise oneself and initiate action. Factors that undermine competence are those that remove or limit agency and confidence, irrespective of innate or developed ability. Performing well at a task does not necessarily result in a feeling of competence, especially where a lack of self-initiation and/or self-regulation involved.

Relatedness, as the second basic need, asserts that a main aim of human behaviour is to foster belonging and significance. Conversely, there is also a need “to avoid rejection, insignificance, and disconnectedness” (Ryan & Deci, 2017, p.96). Therefore, the social interactions that teachers have with local and national school cultures can result in behaviours, beliefs and values that are shaped and internalised by the predominant views of those in a position to grant approval and acceptance, as well as those of peers. The more that a human being has a sense of belonging or relatedness in a social context, the more likely they are to internalise the beliefs and values of the culture; rather than behaviours being self-regulation of external motivation (introjected regulation) or imposed and regulated from outside (external regulation).

The third basic need, **autonomy**, “concerns the extent to which people experience their behaviour as volitional or as fully self-endorsed, rather than being coerced, compelled, or seduced by forces external to the self” (Ryan & Deci, 2017, p.97). Being autonomous is not the same as being independent in SDT, the latter implying separateness and non-reliance on others, whereas autonomy is seen as *acting* with autonomy and also interdependent in key relationships with individuals and groups. It is not considered as an act of rebellion or defiance against an authority, but the ability to act with volition.

Research Design

The research design for this study was convergent mixed methods, collecting qualitative and quantitative data at a single data collection point (Creswell & Creswell, 2018). An online questionnaire was used to enable a wide range of participants to respond to the survey. The benefits of questionnaires include the potential to reach a wider audience and gather a large amount of data. However, limitations include the potential gap between what participants say

or believe and how they act. The research paradigm adopted for this study was pragmatism, being concerned with the actions and behaviours of D&T educators in their personal contexts and situations (Creswell & Creswell, 2018). The researchers' axiological position is that educational research is important and has value, and that there is a need for systematic investigation of D&T education. This is an inductive study, seeking to reveal and explore D&T educators' views and experiences (Guba, 1990).

The study had ethical approval from Liverpool John Moores University and followed British Educational Research Association (BERA, 2018) guidelines. The initial invitation to participate was sent through the D&TA mailing list, with gatekeeper consent from the CEO and Board of Trustees. The data was collected over a period of four months spanning the end of the summer and beginning of the autumn terms in 2021. The initial sampling method was purposive, with social media being used for snowball sampling to maximise the return rate. The sample size was 277, which represents approximately 15% of the Association's membership at the time of completion of the survey. At a confidence level of 95% and confidence interval of 6, this sample was considered to be sufficient for this initial study.

Findings

With our focus on SDT as our approach to analysing and understanding D&T educators' interests and relationship with research, we explored the extent to which there was evidence of *competence, relatedness* and *autonomy*.

Competence

Competence is a motivating factor for the process of learning and engaging with our environment. Teachers need to have a secure body of conceptual and procedural knowledge about teaching and learning to be *and* feel competent in the classroom. The same is true for researchers, who have a different, yet complimentary body of knowledge. Key factors associated with competence are a sense of being able to self-organise and take action, and feeling competent is as important in SDT as effective action. Therefore, undermining competence removes or limits agency. Performing a task well (*being* competent) is different to a feeling of competence, particularly in circumstances where the ability to self-initiate and/or self-regulate has been impinged.

There was a high level of interest in generic (91.7%) and D&T specific (96.4%) research (Table 4), with the proportion of approximately half switching from quite interested in generic to very interested in D&T research, but this does not automatically lead to or infer a sense of competence.

Table 4. How interested are you in educational research?

Level of interest	Very interested	Quite interested	Quite disinterested	Very disinterested
In general,	114 (41.2%)	140 (50.5%)	20 (7.2%)	3 (1.1%)
Specifically D&T	150 (54.2%)	117 (42.2%)	8 (2.9%)	2 (0.7%)

When asked whether they use D&T educational research to inform their practice, or as part of their role, almost half of participants (48.0%) stated that they used research some of the time (Table 5). A relative lack of confidence or competence could be inferred, when compared to

those who stated that they used it all the time (11.2%), particularly when contrasted with the responses when questioned about their interest in D&T research. The correlation between interest in and frequency of use was low at 0.3 (Table 6), suggesting a disconnect between intention and application, which is illuminated by qualitative comments discussed below.

Table 5 How much do you use D&T educational research?

Frequency of use	Number n (%)
All the time	31 (11.2%)
Some of the time	133 (48.0%)
Rarely	80 (28.9%)
Not at all	26 (9.4%)
Not applicable	5 (1.8%)
Other	2 (0.7%)

Participants who stated that they used D&T research some or all of the time were asked about the research topic(s) they were interested in, and those who rarely or never used it were asked to comment on their reasons. These qualitative responses are discussed below. However, whilst there was a strong interest in D&T related activities (such as ideating, realising, and critiquing), the next highest rated area was into generic research from cognitive sciences, mirroring certain negative comments made by the ‘rarely or never use’ participants. Table 6 presents the Pearson Product Moment Correlation between the questions relating to participants’ interest in generic research (Q6), D&T specific research (Q7), frequency of use of D&T research (Q8) and confidence conducting research (Q9). This illustrates a weak correlation between how positively participants answered these four questions, with the exception of a strong positive link between an interest in generic and D&T research. High levels of interest were not followed by high levels of self-reported competence in using and doing research.

Table 6 Correlations between interest in, use of and confidence

	Q6	Q7	Q8	Q9
Q6 Interest in genetic research	1			
Q7 Interest in D&T research	0.64548214	1		
Q8 Use of D&T research	0.34350632	0.30184877	1	
Q9 Confidence researching	0.41699711	0.30832652	0.31164663	1

103 participants gave responses for why they ‘rarely or never use’ D&T education research. As one might expect, the comments were overwhelmingly negative in terms of perceived or actual competence with educational research (90.2%). However, the more positive (4.9%) or neutral (4.9%) responses provided some interesting insights. One of the ‘rarely use’ respondents demonstrated a high level of competence, having *“taught education research methods in the context of D&T at undergraduate, Masters and PhD levels”* as a retired academic in higher education. Another stated that their *“previous school were not huge advocates of DT [sic.] research and so I became involved in general teaching and learning project about metacognition”* but had been involved with a university *“research project about girls vs boys and creativity and nature vs nurture”*; and another stated that they engaged with *“more generic research on pedagogy which informs my teaching”*. So, it would be misleading to infer that rarely or never using D&T research equates to incompetence for every participant.

Of the more neutral comments (n=5), two expressed a lack of interest in D&T research and three a lack of relevance to their current role. One of those who was not interested stated that they were satisfied with the knowledge they have, suggesting a level of ambivalence towards knowledge generation through research; although they did mention lack of time and access, which came up frequently in more negative comments. The comments revealed a lack of motivation to develop or demonstrate competence, for example one participant stated that their *“job does not require it. I occasionally see it in the press but most of it irritates me”*. Another stated that they were happy with the knowledge they have. In SDT, a sense of agency and motivation go hand-in-hand with the idea of competence. Therefore, these respondents did not appear conflicted or dissatisfied with their lack of engagement, and (potential) incompetence.

Of the 93 more negative comments, the strongest themes were *time and workload*, followed by *awareness, access and relevance* (Table 7). A small number of comments inferred a need for *training* to access, interpret and apply research, and others on the negative implications of whole school *policy* on research engagement e.g., *“too many whole academy policies based on other schools that don't directly relate to DT [sic.]”* and a *“conflict with school teaching policy/methods”*.

Table 7 Factors affecting use of D&T research

Factors	Instances (n)
time	42
awareness	26
access	24
relevance	17
training	9
policy	8
workload	7
motivation	6

Even within the negative comments, there was evidence of a desire to engage with research, and possibly frustration at the obstacles in the way.

“Keen to try new things and keep up to date as long as they are practical...”

“I would like to read more right across the publication options. I do feel it would help our department and my teaching; I would hope to do more this year...”

A feeling of incompetence can be associated with the ability to initiate, organise and regulate activities by oneself being hindered, e.g., external factors prohibiting or discouraging autonomous action. A variety of factors affecting the competence of participants in relation to D&T research could be considered as external, such as time, training, policy and workload (as they are largely outside of the control of the individual educator). Collectively these account for approximately half (47.48%) of the responses, with time and workload representing 35.25%, issues related to policy 5.76% and a lack of training 6.47%. All were perceived to affect engagement with D&T research. Of the more internal factors, a small number of participants view research as irrelevant (12.23%) to their current situation or were unmotivated or disinterested (4.32%), self-selecting themselves to not develop or nurture competence. In that

blurry boundary between internal and external factors, over a third of the responses cited a lack of awareness to (18.71%) or access to (17.27%) D&T research.

Whilst it could be argued that teachers could (and in a small number of cases do) engage with research, considered together with the perceived lack of training, there is a strong case for this being an area that could be addressed externally - i.e. resources to increase the visibility of quality D&T research and the tools to access and use it with confidence. One participant commented that they *“have found that there is very little subject specific research for D&T that [they] find relatable”*. Irrespective of whether the research is available, it is clearly not the experience of this D&T teacher, and many others who lack competence through a lack of knowledge of how to find quality D&T research.

Issues of time and workload can be outside of direct control of schools or teachers. Consequently, a response that merely provides access to peer-reviewed research articles is unlikely to address the relative lack of engagement. Any solution to the problem must take account of the governable variables, such as producing resources requiring teachers to invest less of their valuable time to digest, synthesise and apply research findings in their classroom practice. Several participants were interested in pursuing postgraduate studies to undertake research, but thwarted by schools' pressing concerns on examination results, Ofsted inspections, Government prescribed theories, and core subjects, with limited support in terms of time and funding. This was not the case across the board as there was evidence of schools with a culture of research, and time allocated for research. But the overwhelming response was that support to develop competence is not generally available for D&T educators to feel confident as consumers and users of subject-focused research. In the words of one secondary curriculum leader:

“More teachers would be willing to engage in educational research if time was given for this. Unfortunately, it is another thing to fit in and impacts on work life balance.”

When asked how confident they felt undertaking educational research (Q9), over two thirds expressed that they were very (18.8%) or quite (48.7%) confident (Table 8). There is an interesting relationship between the responses in Tables 4 (application) and 8 (confidence), with a relatively weak positive correlation of 0.31 between self-reported application of and confidence undertaking educational research (Table 6).

Table 8 Levels of confidence with research

Confidence level	Number n (%)
Very confident	52 (18.8%)
Quite confident	135 (48.7%)
Quite unconfident	70 (25.3%)
Very unconfident	26 (7.2%)

Whilst over half of the participants were *very* interested (54.2%) in D&T educational research (Q7) (Table 4), the correlation between this and application was low (0.34), and confidence low to moderate (0.42), indicating that there is a gap between motivation and practice (Table 8, above). A significant minority (43.3%) gave the same response for both their current use of D&T research (Q8) and their confidence in undertaking research (Q9), with about one third (34.7%) stating a higher level of confidence undertaking research than frequency of using it. However,

as indicated above, a lack of time to engage with and access research were stated as key barriers to using it (Table 7). The slightly higher correlation between interest and confidence, compared to interest and application, could be associated with the lack of time, awareness, and access, suggesting that interventions and support that reduce time and effort required to access research findings could have more impact than simply training teachers to be more confident consumers and users of research, factors that could support teachers' sense of relatedness and autonomy, as well as competence.

Relatedness

The sense of relatedness, in SDT, could also be described as a sense of belonging, and is significant for creating and developing a community of educators interested in using or undertaking research in D&T.

SDT focuses on the degree to which human behaviour is self-motivated and self-determined. Good education relies on educators being highly motivated and desire to make a positive difference in peoples' lives. D&T is a subject that revolves around collaboration amongst several areas of expertise. For example, in a small number of qualitative responses (n=15), there was a focus on the D&T content knowledge, such as food, textiles, etc., rather on pedagogical approaches. However, the two most popular foci for both middle leaders and classroom teachers were pedagogical (n=34) and strategies for ideating (designing) (n=27).

Table 9 Interventions to Support D&T Educators

	I would definitely use this	I would probably use this	I would probably not use this	I would definitely not use this
A web portal with links to D&T related research.	159 (57.4%)	100 (36.1%)	11 (4.0%)	7 (2.5%)
Guidance on conducting D&T research in the classroom.	124 (44.8%)	113 (40.8%)	28 (10.1%)	12 (4.3%)
Online research seminars with experienced D&T researchers.	108 (39.0%)	130 (46.9%)	31 (11.2%)	8 (2.9%)
ResearchMeet events with D&T educators presenting their research.	92 (33.2%)	118 (42.6%)	53 (19.1%)	14 (5.1%)
Research networking events.	82 (29.6%)	116 (41.9%)	68 (24.5%)	11 (4.0%)
Mentoring for research.	61 (22.0%)	109 (39.4%)	91 (32.9%)	16 (5.8%)
Writing retreats / workshops.	48 (17.3%)	73 (26.4%)	113 (40.8%)	43 (15.5%)

As noted in the findings on competence, there was a strong sense of relatedness to educational research being an area of interest; with 91.7% of participants interested in educational research in general and 96.4% interested in D&T specific research (Table 6). This was further supported by 93.5% interested in a web based portal for D&T research, as the most popular of the suggested interventions (Table 9). A smaller, but significant, percentage of 85.6% said they would definitely or probably use guidance to support them in conducting D&T research within the classroom, suggesting a strong desire to embed subject specific research into their practice.

When participants were asked to rate 7 potential interventions to support them to engage with research, the most popular option was access to an online portal to foreground D&T related research, with majority stating that they would definitely (57.4%) or probably (36.1%) use the resource (Table 9). This was closely followed by guidance on conducting research in the classroom, and slightly fewer who would definitely (44.8.4%) or probably (40.8%) use the resource. Linked to the data discussed above, these options represent the most controllable and time efficient way for busy teachers to access support in their own time and at their own pace. Two options involved with research findings being shared also had a strong approval rate, with seminars from experienced D&T researchers representing a combined 85.9% of the 'use' responses and ResearchMeets at 75.8%. The interventions that could be considered as more time consuming, were less popular, but the approval rate for networking events and mentoring was still noticeably high, indicating that the interventions that participants related most to were those that bridged the gap between interest in, and using research in the classroom. The opportunity to connect with peers and more experienced colleagues, whilst rated lower than those that related to the participants classroom practice, still had a relatively high approval rate, indicating an interest in belonging to a community of practice for D&T research. Even the 'least' popular intervention, writing retreats and workshops had 17.3% of the participants responding that they would 'definitely use' these. If these results can be trusted, this is positive and indicates a desire to belong to a community where subject research is valued.

Table 9 also highlights that there are barriers to engaging with research. The highest rated interventions are potentially the most easily relatable and accessible to busy teachers who are keen to belong to a D&T research community as a consumer and user of research, but possibly not ready to engage as an investigator, linking to aspects of relatedness that emphasise humans' natural growth toward positive motivation, development, and personal fulfilment.

Of the 164 participants that stated that they used D&T educational research to inform their practice or as part of their role 'all of the time' (n=31) or 'some of the time' (n=133), there was a range of different areas of research interest. There were 143 qualitative responses to the question "What research topics are you interested in?" (Q8b.). The initial open coding identified 48 themes, which were refined down to four overarching themes (Table 12).

Table 10 Themes of Research Interest

Theme	References (n)
Pedagogy	161
Curriculum	98
Equality, Diversity and Inclusion	51
General	29

A significant proportion referred to pedagogical (n=161) and curricular (n=98) research (Table 10) providing an insight to the areas that they most closely related to. However, there were also a significant number of references to research that could be categorised as equality, diversity and inclusion (EDI), which reflects the increased attention this has received in recent years and a desire to include all learners in D&T activities - both indicators of relatedness. There were a wide range of different topics, and further analysis of the broad themes in Table 10 revealed the majority of responses related to fundamental D&T activities of ideating, realising and critiquing (alternatively designing, making and evaluating) (Table 11) suggesting a

high level of relatedness to subject specific research themes. However, the second highest category related to more general cognitive sciences research, such as metacognition and retrieval, which could suggest a degree of introjected regulation. It is perhaps unsurprising that themes from the cognitive sciences featured highly in responses, with this body of research currently being proscribed by the DfE and Ofsted, in England.

Qualified teachers who did not hold a management post also mentioned designing, making and creativity at a similar rate (19.6%) to the broader educational themes - as their top rated area of interest - compared to those with management responsibility (13.0%) - as their second highest after pedagogy in general (19.6%). The majority identified more than two different areas of research, which could indicate a degree of ease with which they relate research to day-to-day classroom practice.

Table 11 Sub-themes of Pedagogical Research Interest

Pedagogy sub-theme	References (n)
Fundamental D&T activities	41
Cognitive science concepts	27
Information and communication technology	20
Assessment	15
Motivation	10
Project-based learning	8

Three quarters of the responses represented in this sub-theme linked to activities associated with ideating, such as methods of teaching the skills and knowledge focussed on co-creation, design thinking, empathy, iterative design, modelling, and sustainable design; as well as:

“how recording the design process disrupts iterative design”

“higher level thinking skills within the iterative design process”

“convergent and divergent thinking through D&T and creative problem solving”

For participants who stated that they do not (9.4%) or rarely (28.9%) use D&T educational research (Table 5), the most frequent reasons were time (n=42), awareness (n=26) and access (n=24) (Table 7). However, the fourth category with most frequent mentions was regarding relevance (n=17), intimating that educational research was not something that they related to or critical to their communities of practice. A small number of these participants cited a lack of training (n=9), the restrictiveness of school policy (n=8), workload (n=7) and a lack of motivation (n=6), suggesting that they did not see research as directly related to their core responsibilities as educators.

These barriers, though present, should not detract from the evidence that most participants were interested in educational research. However, there is a gap between aspiration and action, and any solution must be relatable to educators' daily experience and build a sense of belonging in a community of teacher-researchers. SDT supports this analysis, illustrating how educators want to support their profession through professional development for the good of their own classrooms and practice. Though there were clear reasons as to why educators were

not engaging with research as consumers, users and/or investigators, it appears that there is a desire to be involved. The participants who expressed an interest in engaging with future research identified a wide range of themes. The NVIVO (Lumivero, 2020) generated word cloud in Figure 1 illustrates the frequency of the 500 most common word matches, including synonyms. Most of the themes were directly linked to D&T, which suggests that related to subject specific research. D&T research topics ranged from the role of practical work to design, to knowledge, to gender, and sustainability. Of the most directly D&T related word in Figure 1, 'design' was associated with the synonyms: designing, designs, planning, project, projects, purposeful; with a weighted percentage of 4.7%, behind the more general 'learning' at the top (synonyms: instruction, know, knowledge, learn, reading, teach, teaching) at 5.3%.



Figure 1 Word cloud of research interests

Autonomy

A key aspect of the extent to which educators chose to access, use or conduct research is the level of autonomy they perceive themselves to have. In relation to the survey conducted, a range of insights emerge into individual decisions and actions in respect of the level of autonomy an individual feels. No questions in the survey explicitly sought autonomy related perspectives, but a number of questions resulted in such insights being revealed. These insights appeared across what could be seen to be a continuum from respondents expressing a positive sense of autonomy such as agency to those making negative statements that signalled a sense of helplessness. Through qualitative data analysis, statements were categorised into one of three points across the continuum – showing autonomy, aspirational and lacking autonomy.

Showing autonomy comments signalled autonomy linked to feelings such as agency, acting in relation to own beliefs, goals and values, self-determination, self-sufficiency, independently choosing own behaviours, actions, and decisions, confidence. *Aspirational* comments were also positive, tending to indicate how a respondent would like to operate, using terms such as plan to, hope, ambition, wish, desire, intention and inclination. *Lacking autonomy* comments

indicated feelings such as lack of control, helplessness, powerlessness, being incapable, being coerced.

Four questions revealed aspects of autonomy. The first of these was a four part question starting with *Do you currently use any D&T educational research to inform your practice or as part of your role?* Participants selected from a drop down list consisting of: *Yes, all of the time; Yes, some of the time; Rarely; and Not at all* (Table 5). Statements that showed aspects related to autonomy were revealed in the third part of the question: *Please tell us why you do not or rarely use D&T education research.* From a total of 73 comments linked to autonomy, not surprisingly, the majority of the comments indicated a lack of autonomy, with just a single comment indicating a level of autonomy through showing a keen commitment to research and two aspirational comments indicating a desire to engage with research, but also highlighting challenges as shown in the comments below.

"I have focussed on core subjects as part of my career development to date. As subject lead I now have a keen interest and will be engaging with research." (keen interest, will engage)

"I would definitely like to more, but it is difficult due to lack of time and workload."

"Keen to try new things and keep up to date as long as they are practical and don't add work"

The vast majority of comments showed a lack of autonomy, lack of control, helplessness and a level of coercion as illustrated in the following three comments.

"We are very focused on more general pedagogical research in our school, for example of literacy, knowledge acquisition and recall etc. This leaves little time for extras and DT specific research needs to be pushed to us because we are not good at going looking for it." (lack of control, incapable)

"Not knowing how or where to access useful research." (helplessness)

"time constrains, too many whole academy policies based on other schools that don't directly relate to DT that we have to implement" (lack of control, being coerced)

The question that followed shifted the focus to levels of confidence in undertaking research, asking respondents: *How confident do you feel undertaking educational research? Do you have any comments?* The first part of the question gave respondents a drop down list: *very confident; quite confident; quite unconfident; very unconfident* (Table 8, 12). This was followed by asking for any comments on their choice. Table 12 shows the numbers of respondents answering the first question on levels of confidence and also the numbers adding comments.

As can be seen from the table, only a small number of respondents added comments (8%). Despite the small numbers, a noticeable aspect is that more comments have been made by those feeling confident about research, but also that even within this group there is evidence of a lack of autonomy. The following two statements illustrate this, both made by teachers who are very confident in their research skills, both secondary teachers with considerable experience, one indicating agency, confidence, independent actions - *"I have a science*

background and those research skills transfer well. I have helped several colleagues/PGCE students devise experiments when they needed to gather data that is measurable. Think this sounds like a great project”, the other lacking autonomy, expressing a lack of control: “Design and technology teachers have a tough time keeping up with relevant research as our subject content changes daily - when did Pythagoras theory last change?! Not much time in PPA [Planning, Preparation and Assessment] to do this”. Aspirational comments were the most common and spread from confident to very unconfident, for example an early career primary teacher showing ambition and aspiration, stating “I am looking to develop my confidence with research as part of my personal development as an Early Career Teacher.” Comments indicating a lack of autonomy also highlighted a sense of frustration with education policies that created a lack of control and power - “Since taking up my current role in an academy (3 yrs ago) I feel like I work in an educational factory - told what to teach and how to teach it. It’s Like everything is done to tick a box”.

Table 12 Confidence levels and indications of autonomy

	Levels of confidence	showing autonomy comments	aspiring comments	lacking autonomy comments	Totals comments
Very confident	57	6	2	1	9
Quite confident	143	2	10	4	16
Quite unconfident	71	1	3	1	5
Very unconfident	20	0	1	3	4
TOTALS	291	9	16	9	35

The third question providing insights into levels of autonomy asked: *Have you conducted, presented or published educational research? Do you have any comments to explain your response?* The first part of the question resulted in 68% of respondents stating that they had not conducted, presented or published research. Despite the high numbers not having done so, both groups provided comments to explain their answers and once again insights into showing or lacking autonomy were revealed.

Table 13 Conducting, presenting, publishing research

	YES	NO
Numbers conducting, presenting, publishing research	94	197
Comments to explain	yes	no
Showing autonomy	24	0
Aspiring	5	11
Lacking autonomy	1	4
TOTAL COMMENTS	30	14

Those having undertaken research were most likely to indicate a level of autonomy, often reported with confidence. An example of this from a secondary teacher refers to research going against a mainstream view, investigating the “*role of social media in supporting teaching and learning at a time when some educators/schools are trying to ban mobile technologies and social media in schools*” - indicating agency, acting in relation to one's own beliefs, goals and values, independently choosing behaviours, actions, and decisions and confidence. The majority of comments from those who had not conducted, presented or published research fell into the aspirational category, showing ambition to engage with research, as illustrated by this

secondary teacher: *"It is a recent interest for me and I'm not sure where to start. I generally research small-scale in my classroom"*; or a desire to engage, such as: *"I would love to get involved"*, by a primary/secondary teacher. Inevitably there were those expressing helplessness and a lack of capability, as was stated by a secondary teacher *"I wouldn't know where to start, it seems like it would be out of reach."*

A final question *"Do you have any other comments or suggestions related to educational research?"* provided an opportunity for open comments and 21 reflected some aspect of autonomy. The majority (n=16) showed a lack of autonomy, and control, often coupled with a level of frustration, for example, *"Senior Leadership support that we need to research, but then do not allow the time or do not have the budget to do it."*, *"I have applied to start a Masters 3 times but English and Maths teachers have been selected. I was informed this is due to the subject being core"*, *"Research is often whole school based rather than subject specific and as such can often overlook the different requirements of more practical subjects such as D&T"*. This contrasted with a small number of positive comments that supported autonomy in research such as *acting on own beliefs, values as was contributed by a secondary school head teacher stating that " we have a research culture at the school where every teacher produces a research project on a theme of their choosing"*

The demographic data collected in the survey enabled us to explore the extent to which comments were impacted by age group taught (primary, secondary or tertiary) The examples shown above, are drawn from across the spectrum of demographic data. No constituency was exempt from indicating autonomous behaviour or experiencing a lack of autonomy in respect of engaging with D&T education research.

Discussion

Comparing the findings from this study with the aims and assumptions of education policy makers in England (DfE, 2017; Ofsted, 2020), it is clear that there are some similarities and differences in what is valued and sought by teachers of D&T. It is evident that D&T educators share the view that being research-informed benefits teaching and learning in schools. However, this is where the similarities end. Most of the participants did not feel that they have access to relevant and high-quality D&T research readily available, which they value even more than generic educational research. Nor do they feel they can actively engage with and apply it, with a variety of reasons stated - time, awareness, access, and relevance being the main barriers. There was little consistency of experience and engagement (competence) following directly on from interest, and the overwhelming response was that support is not generally available (relatedness) for D&T educators to feel confident as *consumers, users, and/or investigators* of subject-focused research (autonomy). The analysis of data from all three perspectives (competence, relatedness, and autonomy) highlights that teachers do want to engage in research, which we find extremely promising and something that should motivate future interventions and opportunities related to D&T research capacity and engagement. Yet, in the current climate, a general lack of confidence engaging with research (competence), and opportunities to network with other teachers and researchers (relatedness), results in a feeling of disconnect between interest and action (autonomy). It is clear that any future interventions should focus on building confidence and connectivity, facilitating agency for teachers to self-regulate their classroom environment, drawing on a wider body of research findings alongside their own practitioner inquiry.

However, it is also clear that interventions that focus solely on providing access to training on research and peer-reviewed journal articles (considered to be the gold standard of research) may not be the most effective approach. The prevalence of factors associated with the pressures of time and workload, in the current context of schools in England (inc. pressures associated with high stakes inspection and testing, teacher recruitment and retention, and lack of access to professional development), challenges those who support teachers of D&T (e.g. the D&T Association, consultants and academic researchers) to think again about a cogent, coherent, and connected strategy to engage teachers with subject research. For example, rather than merely training teachers how to read and interpret a research article (which in our opinion does have value), a more cogent approach might be to provide them with ready access to executive summaries, synthesising the key learnings from research related to practical classroom scenarios, written for busy professionals and focusing on impact in the classroom. This was reflected in the proposal for an online portal with access to research being ranked as the most popular intervention. This is an option where teachers can self-organise and self-regulate their engagement with research and could result in an increased sense of agency (autonomy and competence).

We propose that reducing the time and effort required to access high-quality and impactful research could be more successful in achieving the goal of a more research literate community of D&T teachers, than simply training teachers to be more confident *consumers* and *users* of research. This does not negate the need for higher levels of engagement with research, but this will be of interest and relevance to a smaller and self-selecting subgroup of the community. The push from teachers for high-quality D&T research is not *against* generic research (such as the government sanctioned cognitive sciences), but for a *rebalancing* of the diet of research findings that are available and promoted by authorities. Interventions such as networking and ResearchMeet events provide opportunities for teachers to develop as consumers and users of research, but also to belong to a community where teacher-research is encouraged and fostered. Teachers who want to go further as investigators in their classrooms (autonomy) have a greater chance of accessing mentoring and other support to advance their skills (competence) by being part of such communities (relatedness). However, the challenges to teachers' workload should be borne in mind with any strategic approach to increasing D&T teacher competence, relatedness, and autonomy outside of their core teaching duties. The aim being to make it more straightforward to incorporate evidence-based practice into every D&T classroom.

In terms of the research questions, it is evident that the level of interest outstrips the engagement with education research (RQ1), but there is strong interest in a range of interventions to support (RQ2). The answer to the research question on where the D&T Association should prioritise educational research (RQ3), is more complex and has only been touched on in this article. However, it is clear that a good proportion of the participants have an interest in pedagogical research exploring the fundamental D&T activities of ideating, realising, and critiquing, particularly the former. But this should not be at the expense of nurturing a rich research landscape, including curriculum and EDI matters, as well as contextualising cognitive sciences research in D&T.

Next steps

Since the survey was conducted, things have started to progress; the D&T Association's membership has grown exponentially, especially in Primary schools, possibly as a result of school inspections seeking evidence of a 'broad and balanced' curriculum. The DTSRG has been established, and a website (researchingdandt.co.uk) has recently been launched with links to books, podcasts and websites that will assist D&T teachers in accessing subject specific research. The DTRSG, with the support of the D&T Association now hosts bi-monthly online ResearchMeets, providing opportunities for presentations, discussions and information sharing. But the question remains - how do we ensure that individual schools see the value of subject specific research that can lead to personalised Professional development for teachers that will develop the subject and promote the broad and balanced D&T curriculum that will develop D&T capability. The survey has provided insights into needs, opportunities, barriers and challenges. Next steps are now to use the insights gained to strengthen the competence, relatedness, and autonomy of the D&T community.

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