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Research Question Cluster Three:

- *What is the particular role of D&T in the education of pupils with SEN?*
- *How can D&T engage pupils with particular needs and interests?*
- *Is there evidence that D&T is especially effective in engaging pupils with SEN?*
- *Is there evidence that pupils with SEN make more progress in D&T than in other subjects?*

Introduction

In a sense, all children have special educational needs and are gifted and/or talented. In systemic education, caution is always needed with regard to the labeling game and how, for example, “SEN” can be merely a system-based articulation of educational homogeneity’s reaction to itself. It is perhaps the case that the teacher who works from a personal professional philosophy of humanity and compassion sees the child first and foremost as person-with-needs and works outward from there. In times of instrumental, under-resourced and performance-driven education two phenomena occur regarding this question cluster. First, D&T finds itself stretched to meet competing curricular demands where any sense of ‘the student’, no matter how defined, is not the foremost consideration of the hard-pressed teacher. Second, SEN, despite being an increasingly multi-dimensional umbrella term, finds itself as always in danger of being an ‘add-on’ for consideration after priorities necessary to the system’s own existence are attended to first. Such is the context that we see as informing the overview that follows.

Diversity of need

While the cover page of the Manifesto for Design and Technology Education (2011), compiled by the Design and Technology Association, may be making it’s point via images of key supporters of the field to those beyond the field, the collection cannot be said to represent the diversified face of the United Kingdom, or indeed of any country.

If the profession is serious about delivering a message about the capacity of Design and Technology to actively and productively engage all students in real learning that enables them to contribute in meaningful ways to thriving communities then it needs to demonstrate inclusivity and diversity in any

message being delivered. Including statements from students who have special needs would be a good place to start demonstrating how the subject offers all students significant opportunities for learning. This opening point made, the Association's website offers a rich range of SEN guidance and resources for its members (and many non-members around the world).

Children with Special Education Needs (SEN) come from diverse backgrounds, have diverse needs and hold diverse dreams for their futures. Their need or disability may be physical, emotional, behavioural, social or they may have a health condition that precludes them from learning and engaging at an age-appropriate capacity. They may be Gifted and/or Talented and require a differentiated curriculum in order to meet their specific, special needs. Children placed under an SEN umbrella are widely diverse in their needs. What makes their needs special is that in order to meet (systems-based) pre-determined educational, social, or physical benchmarks they require more time, human assistance or technological support. They may require an individualized learning pathway framed as an Individual Education Plan (IEP) or Negotiated Learning Plan (NLP). One in 20 children in the United Kingdom has a disability (DWP, 2010) and the most common disability of the 10 million people in the UK who are ascertained as being disabled, affects their mobility (Family Resources Survey 2008/9).

Children who have SEN are either educated inclusively in mainstream schools or offered placement in separate 'special' schools. The Alliance for Inclusive Education (ALLFIE) have campaigned for all children to be educated in mainstream schools and suggests that children who have a disability continue to be lawfully discriminated against even with the Equality Act (2010) providing guidance on the placement of children in schools. ALLFIE's (2011) response to the House of Commons' (2011) Special Educational Needs Green Paper focuses on the premise that inclusive education benefits not only those with a disability but all learners. The 2006 OFSTED report "Inclusion: Does It Matter Where Pupils Are Taught" agrees and advocates suitably resourced mainstream schools that contribute to high academic, social and personal outcomes for all pupils.

While statistics indicate that there is marked improvement in these outcomes for children with SEN there is still some way to go to ensuring that all children reach their potential. Data of GCSE attainment (DCSF, 2009) offer one measure of 'educational success' through the following figures that illustrate how progress is possible, in a relatively short period of time, if effort is focused on providing quality education for all. Between 2005/6 and 2008/9 the percentage of pupils at the end of Key Stage 4 achieving five or more GCSEs at grade A*-C has increased from:

- 9% to 15% for students with SEN who had a statement;
- 20% to 40% for students with SEN who do not have a statement; and,
- 66% to 80% for students without SEN (DCSF, 2009).

While the improvement is laudable, the differential between those children with a SEN statement (15%) and those without SEN (80%) is significant.

Statistics from the Labour Force Survey, Quarter 2, 2008 (ESDS, 2008) demonstrate the result of the challenges faced by students with SEN who work to achieve sound GCSE scores; students without a disability are twice as likely to hold qualifications than those who have a disability. Once students with SEN leave school they are half as likely to gain a degree than students who have no disability.

The differential continues, as students move into the workforce where 24% of the workers who have a disability do not hold any formal qualifications compared to 10% of workers without a disability. If we put some of these figures together they demonstrate the powerful drive and determination that students with a disability must have in order to complete a university degree. If 15% (2008/9 figures NPD) complete five GCSEs at A*-C level then the 11% of people with a disability who have a degree-level qualification (2008 figures LFS) demonstrates a remarkably high level of achievement.

Design and Technology offers all students an opportunity to engage in creative problem solving activities that harness higher order thinking, academic, social, fine motor, and emotional skills to manage an innovative project. It engages skills through material from broad cross-disciplinary subject matter (Twissell, 2011). It can provide the vehicle through which students can be engaged in authentic learning experiences (Rouse, Cannon-Bowers & Salas, 1992; Edwards-Leis, 2010) and have their imagination captured at the same time. The possibilities of engaging children in Design and Technology projects supports the argument for providing real learning contexts for IEPs and NEPs for students with SEN.

Existing support from literature and agencies

There appears to be little current research on Design and Technology for children with SEN. Much that is available focuses on students who are Gifted and Talented (Balchin, 2005; Reis and Renzulli, 2008; Twissell, 2011) while other special needs (hearing, visual, physical, intellectual, social, behavioural, health) appear to be addressed infrequently if at all within the Design and Technology context: a very disturbing reality given the profession's claim that the subject offers significant opportunity to all students. Given the 1,470,900 children with SEN many of whom have undiagnosed impairments or health issues (Dept of Education, June 2010) there is a gaping hole in the research if all of the students who attend mainstream schools are required to study Design and Technology as a core subject through Key Stages 1, 2 and 3. A focus on vocational training/education may offer some areas of useful research but a narrow focus will not provide the evidence of how Design and Technology can contribute robustly to the participatory process of education for children with SEN.

The Design and Technology Association in association with the Disabled Persons Transport Advisory Committee (DPTAC) have made significant efforts to provide useful resources for teachers in all Key Stages at Primary and Secondary Schools who are working with students with SEN. “Designing Everyone In” promotes the development of inclusive learning environments by using existing school resources to make the program of work as accessible as possible. Some of the Primary projects involve such diverse activities as designing for fairgrounds, homes and playgrounds that have been adapted from existing DfES/QCA Schemes of Work units for Design and Technology. Worksheets for the adapted units are available as are PowerPoint slides (with embedded teacher notes) that could also be used as prompt cards in classrooms.

Such provision of guidance or support for teachers is unequivocally beneficial and necessary. Davies (2004) suggests that while the activities have been differentiated so as to meet the diverse needs of children with SEN, they also provide opportunities for all students to be engaged in rigorous processes such as critiquing, designing and making (Keirl, 2003). Many Design and Technology activities can engage students without the need for a copious paper-presentation of ideas or indeed any other dominant or prescriptive form of communication (death by powerpoint comes to mind). Similarly, the opportunity for cross-curricula engagement continues to be evident, not only in these activities, but also in all projects undertaken within the realms of Design and Technology.

The support provided by the Design and Technology Association through adapted projects from the Secondary Strategies Design and Technology Framework promotes inclusive practice opportunities such as “It Really Bugs Me” and “Journey in the Life of” projects. These materials enable teachers of Key Stage 3 to provide students with tasks that address authentic design issues for people with disabilities in the community. Projects are also included that engage the students in authentic investigations that do not focus on inclusive modifications of artefacts or the environment: the investigations invite all students to seek solutions to issues that do not highlight ‘need’, but celebrate diversity. Above all Design and Technology can provide the opportunity for tasks that are differentiated on interest, meaning and need to be undertaken by all students.

The House of Commons Education and Skills Committee (2006) in their Special Education Needs Third Report of Session 2005-06 Vol 1 suggest that one of the greatest threats to the provision of effective learning support for students with SEN is the breakdown in support for students in the transition between Primary School and Secondary School (Para 339-340). This area of research would also offer significant opportunity to gain understanding of what happens when students with SEN move from a one-teacher (with often one teaching assistant [TA]) environment into one that is populated with teachers from different subject areas and, often, different TAs. Another focus for research could be the propensity for Secondary Schools, due to restricted resourcing, to determine a

curriculum for students with SEN (ALLFIE, 2011) that may preclude them from engaging in Design and Technology due to the perception of health and safety difficulties with equipment. The participatory process that Design and Technology offers is not without consideration, but the ‘pay offs’ are enormous.

Participatory processes

The Design and Technology Association’s Manifesto (2011) provides some interesting commentary from leading designers in industry and the arts. Have any of these, or any of their associates, a disability? The manifesto also provides some commentary on the nature of the subject and those who seek to teach it. One of the strengths of subject is its attraction to people who have worked in a variety of industries (engineering, fashion, arts) and how their own careers have provided them with overt experiences from within the designed world. As the manifesto states, “They are practical, problem-solving, creative, flexible and challenging individuals who pass on these skills, knowledge, values and inspiration” (DATA, 2011:33). It is salutary that the future of authentic participation in Design and Technology activity is in the hands of such people. However, it is also essential that initial teacher education comprehensively addresses inclusive education practice that is underpinned by a philosophy of social justice and equity. Those universities that provide initial teacher education in Design and Technology should also ensure the incorporation of such a focus in their course design and delivery.

Providing Access

Access to Design and Technology involves multiple considerations given the variety of points of engagement it offers. The subject’s richness and breadth may well be a curriculum asset in the way it can offer a spectrum of entry points (of interest) for students. However, access is only one step of the journey and further challenges emerge for teachers who are to keep all their students engaged in D&T learning – IEP and otherwise. Further, points of access or engagement do not guarantee total engagement by all students with all activities. Thus, teacher professional judgement will be called for in maintaining take-up, engagement and continued interest for students on IEPs.

A major consideration is the diversity of individual need exhibited by the students undertaking the subject. The Design and Technology Association’s website provides resource sheets that address characteristics and pedagogical considerations for students with:

- Attention Deficit Disorder (with or without hyperactivity) (ADD/ADHD);
- Autistic Spectrum Disorder (ASD);
- Behavioural, Emotional, Social Difficulty (BESD); and,
- Moderate Learning Difficulties (MLD) (Davies, 2004).

Each of these disabilities can present itself in a variety of ways in individual students and so, while generalizations can be made as to how teachers might present, manage and assess the learning environment, each individual will require a specific IEP to guide engagement. However, the overview, particularly of the spectrum of characteristics for each disability offers a significant opportunity for the Design and Technology teacher to make access to the subject more fluent. One of the disadvantages of the support provided on this site is that disabilities such as visual and hearing impairment and physical disorders such as cerebral palsy have not been included. This shortfall also replicates that found in the research.

A considerable influence on the accessibility to Design and Technology is the provision of support at school level through the training of teaching assistants (TAs) to work with students undertaking the subject. One of ALLFIE's (2011) concerns, expressed in their response to the Green Paper, was the proper resourcing of schools to ensure equity of access for all students. Funding for mainstream schools that include all children is deficient and it would seem that the struggle to provide "meaningful education to disabled children" through personalized programs is failing (Murray, 2010, pg 27). The training of TAs is also a considerable (financial/time/resource) issue when students with disabilities may wish to participate in D&T activities that stretch the capacity of their assistant to contribute in safe or meaningful ways. If TAs are neither specialist D&T TAs nor willing D&T participants with those they are there to assist then an educational inadequacy exists for SEN students.

Adaptability and reductionism – what are the costs and benefits?

Accessing the Design and Technology curriculum in Key Stages 1, 2 and 3 may entail some adaptation of existing resources such as those produced through the DPTAC project. Such adaptation may involve altering the reporting format used by students when they are providing the evidence of their investigations. Many resources to facilitate this adaptation are available online from such providers as the D&T Association and the *TES Connect* website. What can be problematic is the assumption that a reduction of requirement to report/provide evidence of learning by students with SEN may preclude them from opportunities to gain skills and knowledge that would otherwise be contextualized through the problem solving process embedded in the task. There are undoubtedly an increasing range of communication genres *and* technologies available to students for the articulation of ideas, responses, critique, design, assessment and so on. The use of e-portfolios and the work of the (TERU) e-scape projects on assessment are obvious possibilities here.

A similar concern can be raised through the differentiation required to ensure the Design and Technology curriculum experience is suitable for those students who are gifted and talented. Students who are gifted and talented can often account for 10% of the school's population (DfES, 2006) and it would be reasonable to assume that all of them would be engaging in Design and Technology through

Key Stages 1, 2 and 3. While the level of task commitment demonstrated by students who are gifted and talented can be very high (Mayer, 2005) the tasks themselves may require differing levels of adaptation to ensure that they provide the challenge and opportunity necessary to engage the students. A diversification of adaptation, ranging from a reduction in requirement to an extension of expectation, could stretch the resources available within a single classroom. Therefore, while Design and Technology, as a subject, certainly provides the vehicle by which all students can extend their creative and problem-solving potential, it demands a high level of resource planning and organization (by equally creative teaching personnel) to ensure that meeting the needs of all students does not inhibit the effectiveness of the instructional environment for some.

D&T as the vehicle for IEP delivery

The D&T association website contains a specific section in its Initial Teacher Education (ITE) resources link about pedagogical considerations for SEN. Four sections effectively cover legislation, diversity of need, adaptation of schemes of work and planning for differentiation through IEPs. The IEP is not just a repository of individual characteristics and capabilities of the student but an educational plan that proposes how the student will attain certain learning outcomes in a given period of time. Reading an IEP after it has been written (by others) does not allow the Design and Technology teacher to make a full and informed contribution to the development of the student's skills and knowledge. We would argue that the Design and Technology teacher could be best placed to help construct the IEP given the cross-curricula nature of the subject and its ability to engage the student in developing higher order thinking, academic, social, fine motor, and emotional skills.

Concluding remarks

It is clear that the Association itself has done much to address the needs of SEN students at all levels of schooling. Its resource base and guidance notes are a strong support for members. What more, then, is there to be done? As with other research questions, we can record the absence of comprehensive research into D&T practice, this time regarding SEN. However, we would emphasise that in one major regard D&T is probably no different from most other school subjects in that it is variously well equipped to meet SEN requirements simply because Special Educational *Needs* are hugely varied and must be addressed in personalized ways (the IEP).

While any research into education will come up with resourcing issues facing those working in schools, there is probably a very strong and legitimate argument to be made *across the curriculum* for special attention to be given to focused SEN resourcing and this resourcing should include funding of *significant associated research*. Such research, comprehensively conducted, would scrutinise the potential of curricular interplay between a spectrum of SE Needs, a spectrum of content and a spectrum of pedagogies. This is squarely a matter for funding authorities but it is one that the

Association might well be ready and willing to articulate with such authorities as well as with fellow professional associations and organizations should any hint of such funding arise (despite current economic straits). As with literacy and numeracy, SEN is the duty of all teachers and D&T teachers are no exception – even if resources are scarce.

As the Association recognizes through its advocacy for the field, D&T can be a meaningful place for learning for *any* student. With regard to SEN, perhaps a way forward is to re-engage on matters of content and pedagogy. The content issue is always fraught with competing stakeholder interests vying for D&T's attention and that is our lot in this branch of curriculum. However, much that is undertaken in D&T shares *process* rather than content. Thus, critiquing, designing, making, being creative, communicating and so on give the subject positive opportunities to engage all students whatever their need or disposition.

Constructivist learning theory offers guidance in this direction. When design briefs and projects locate the student at the centre of their own learning they hold the responsibility for that learning. The starting point for the SEN student, in such pedagogy, is the student themselves and the scaffolding, guidance and enabling support offered by the subject (content), teacher (pedagogy), and system (resources) come together in ways that are respectful of the special need as well as of learning style.

Researching the questions the Association has assembled sometimes leads to talk of 'real problems' and 'real world' issues. We would suggest that nowhere is the 'real' more demonstrable than when addressing the needs of students (special educational or otherwise) and working education outwards from the student/s themselves rather from a systemic 'top-down', (positivist, test-based) assessment-driven approach.

Key to good SEN education must be well-educated teachers who can enjoy quality CPD. Such teachers are people who can make good professional judgements that interpret the curriculum appropriately for their students. There are many experiential entry-points available for students engaging with D&T and teacher professional judgement is undoubtedly the primary quality or tool available for successful engagement of students with SEN. (In fact, this is the case for all students in design-led learning). It is the appropriately prepared D&T teacher who weighs the student's needs and potential and who draws on their full pedagogical repertoire to facilitate meaningful learning experiences using the range of genres and mediums offered by D&T education.

References

- Alliance for Inclusive Education (ALLFIE) (2011). Response to the Government 'Support and Aspiration: A New Approach to Special Educational Needs and Disability' Green Paper, Accessed: URL: <http://www.allfie.org.uk/pages/work/greenpaper.html>
- Balchin, T. (2005). A Creativity Feedback Package for Teachers and Students of Design and Technology in the UK, *International Journal of Design and Technology Education*, 10(2), pp. 31- 43.
- Davies, L. (2004). *Meeting the Needs of Pupils with special educational needs in D&T*, London: David Fulton Publishers.
- Department for Children, Schools and Families (DCSF), (2009). GCSE Attainment by Pupil Characteristics in England 2008/09, London: DCSF. URL: http://www.dcsf.gov.uk/rsgateway/DB/SFR/s000900/SFR34_2009FinalUpdated.xls is contained in <http://www.dcsf.gov.uk/rsgateway/DB/SFR/s000900/index.shtml>
- Department for Education Services (2006). Children and Youth Board 2005-2006 Independent Evaluation Report, London: DfES.
- Department for Work and Pensions (DWP), (2010). *Family resources survey: United Kingdom 2008-09*, London: Department for Work and Pensions.
- Design and Technology Association (DATA), (2012), 'We believe in Design and Technology', The Design and Technology Association (DATA), (Aug 2012), URL: http://www.data.org.uk/generaldocs/Manifesto/data_manifesto.pdf**
- Edwards-Leis, C.E. (2010). *Mental models of teaching, learning, and assessment : A longitudinal study*. PhD thesis, James Cook University. URL: <http://eprints.jcu.edu.au/15182/>
- ESDS Government (2008). Quarterly Labour Force Survey, April – June, 2008, #6091, Scotland: Controller of HMSO. URL: <http://www.esds.ac.uk/findingData/qlfsSL.asp>
- Keirl, S. (2003). Design and Technology curriculum dancing a case of treading the light fantastic, under a bushel, with bow legs. In (eds.) Dakers, J. R. & de Vries, M. J., PATT-13, *Pupils Attitudes Towards Technology. Proceedings of the International Conference on Design and Technology Educational Research. June, Faculty of Education, University of Glasgow, Scotland.*
- Mayer, R. E. (Ed). (2005). *Cambridge Handbook of Multimedia Learning*. New York: Cambridge University Press.
- Murray, P. (2010). *A Fair Start: A personalised pathway for disabled children and their families*, Policy Paper 26.10.2010, University of Birmingham, UK. URL: <http://www.hsmc.bham.ac.uk/news/pdfs/a-fair-start.pdf>
- Ofsted (2006). Inclusion: Does it matter where pupils are taught? Provision and outcomes in different settings for pupils with learning difficulties and disabilities. London: Ofsted. Reference no: HMI 2535.
- Rouse, W. B., Cannon-Bowers, J. A., & Salas, E. (1992). The role of mental models in team performance in complex systems. *IEEE Transactions on Systems, Man and Cybernetics*, 22, 1296-1308.
- Reis, S., & Renzulli, J. (2008). Differentiation and Enrichment. *District Administration*, 44(7), 22-23.

Times Educational Supplement (TES), (2012). Teaching resources: Special Needs teaching resources, URL: <http://www.tes.co.uk/sen-teaching-resources/>

The House of Commons Education and Skills Committee (2006), Special Education Needs, Third report of session 2005-06, Vol. 1, London: The Stationery Office Ltd. HC 478-1.

The House of Commons (2011). Special Educational Needs Green Paper, London: The Stationery Office Ltd, HC 1019-i.

Twissell, A. (2011). An investigation into the use of cognitive ability tests in the identification of gifted students in design and technology, *Design and Technology: An international journal*, 16(2), pp. 20-32.

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