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Research Question One:

In what ways does engagement in design & technology projects improve pupils' speaking and listening skills?

Introduction

This small-scale review offers an initial and limited exploration of available research, an overview of some key ideas, and speculations on avenues for further research and action. While there is insufficient solid research evidence to satisfactorily address the question directly, we aim here to describe some of the facets of the issue being investigated. We have taken as comprehensive an approach as possible to the review and our comments are contextualised by four fairly obvious but nevertheless important premises.

First, 'speaking and listening skills' are components of broader understandings of *literacy* - a term that is politically contested with meanings and uses ranging from the technical-instrumental to the critical-emancipatory. Second, there are many *literacies*. The range and politics of 'multiliteracies' was well articulated by the New London Group (1996) who made a clear link between *literacies* and *design* viz: '...we are (all) designers of social futures, public futures and community futures.' (NLG, 1996:65). Third, there is a similar spectrum of discourses around technological literacy (see e.g. Lewis & Gagel, 1992; Keirl, 1999; Petrina, 2000; Dakers, 1996; Keirl, 2006) each of which can variously shape the nature of its associated speaking and listening skills. Fourth, explicit research into speaking and listening skills development in D&T practice is almost non-existent.

Policy

What are some of the most recent educational policy developments around literacy and how do they promote the speaking and listening 'strands' of literacy that can be developed through D&T practice?

In recent years, two reports which contextualise literacy well have been the Independent Review of the Primary Curriculum (also known as the Rose Report) (DCSF, 2009) and the Cambridge Primary Review (Alexander et al., 2009), both of which emphasise the role of linguistic skills in maximising learning. The Rose Report (DCSF, 2009) in particular placed literacy at the heart of recommendations

for a renewed primary curriculum and explicitly defined literacy as the four strands of language: reading, writing, speaking and listening, recognising the mutuality of each of these four strands. Whilst this may not seem particularly radical, for many in education it signalled a move away from a narrower definition of literacy confined to a focus on reading and writing skills, while assuming speaking and listening will develop organically (National Literacy Trust, 2010). There appears to be an emerging consensus from the policy literature that speaking and listening skills underpin most other learning, and provide the platform for development of other literacy skills (DCSF, 2009; Ofsted, 2011) and that opportunities to develop these should be provided across a range of contexts, including Design and Technology (DCSF, 2009; DfE, 2011; Ofsted 2011).

However, Ofsted has highlighted that speaking and listening are often not given the same attention or curriculum time as reading and writing in schools, noting that barriers exist to raising the attainment of learners in literacy, particularly those who are most at risk of not gaining the skills they need for successful lives (Ofsted, 2011). Although the report does not provide a specific focus on D&T, it does make a number of points pertinent to the subject, for example:

- In primary schools, the need for an emphasis on speaking and listening skills from an early age (Ofsted, 2011: p2)
- In the provision for young people and adults, the most successful sessions were those where teachers drew on learners' experiences and ensured that learning activities were closely related to language used in everyday work and social settings (Ofsted, 2011: p3)
- The most effective providers visited reflected on and adapted their curriculum, including any intervention programmes, to meet changing needs. They taught literacy in contexts that were relevant and meaningful to their learners. (Ofsted, 2011: p3)

The Ofsted report concurs with Rose that barriers to literacy development are a particularly significant issue for disadvantaged children (DCSF, 2009; Ofsted, 2011). Rose highlights how children from poorer backgrounds have significantly less exposure to language again pointing to the need to provide learning opportunities in a variety of subject areas (in addition to English) that support development of speaking and listening skills and serve to close the 'word gap' (DCSF, 2009:14)

Policy advice specific to D&T, published by the Department for Children, Schools and Families (DCSF) in 2010 as part of the functional skills support program, highlighted the role of a speaking, listening and communication in 'underpinning and complementing many of the key processes in D&T' (DCSF, 2010:3). The guidance goes on to highlight the many ways in which D&T might provide 'excellent opportunities' to develop their use of speaking and listening in the real life contexts (DCSF, 2010) identified by both the Rose and Ofsted reports as fundamental to language development.

To conclude this review of recent policy it is perhaps important to note that the current Government department responsible for policy, the Department for Education (DfE), has signalled the end of advisory support for the National Literacy Strategy (DfE, 2011a). However, DfE continue to place emphasis on practice-based research that offers insights into learning through dialogue, acquisition of language, widening access and the effective classroom interaction (DfE, 2011b).

Design and Technology at work in the curriculum

D&T plays its special role in the curriculum as a subject – as a field of specialised practice(s) with unique qualities and activities. However, D&T also plays strongly in the whole-school curriculum team. First, it foregrounds the human activity of design which, although identifiable in many subjects, is celebrated through the special nature of D&T. Second, D&T is a strong curriculum integrator – witness best primary practice invariably built around D&T projects giving meaning to other subjects. Thus, third, D&T is potentially holistic rather than atomistic in nature. D&T is a place where meaningful learning can happen. These points are included here because, as a result of them, D&T enjoys (suffers?) a peculiar tension. Because it can be an ideal location for integrating learning, in doing so, it can also be seen as a kind of ‘service’ subject to other subjects. The knowledge that constitutes science, the methods of maths, the literacy through English, expression found in the arts, issues in social studies, can all be given meaning through D&T to the point that D&T’s own subject identity is a challenged one.

This review celebrates D&T’s strong potential to advance speaking and listening skills as a natural and integral part of best D&T practice rather than as an add-on service for another aspect of curriculum. Literacy is the duty of all teachers and D&T can do much to advance any aspect of literacy while maintaining its own educational integrity. Indeed, D&T’s own pedagogical practices can be strengthened through careful attention to speaking and listening.

Nor must it be forgotten that technologies are so taken-for-granted in the public realm (as the fish that doesn’t see the water) that the role of language in maintaining this invisibility is rarely critiqued or foregrounded. There are countless technological and design idioms, analogies and metaphors present and alive in everyday speaking and listening practices that cannot be left out of consideration here. We might also consider ways in which we develop our *ecological rapport* through how we ‘listen’ and ‘speak’ to materials (and them to us) through D&T practices. We could ponder the senses of design as a form of question-asking and of technology as one of question-answering. While speculations such as these may seem remote from the ‘obvious meaning’ of what constitutes listening and speaking, we believe they are an important part of a picture worth developing.

If one of D&T's ongoing battles is with the ill-informed image of it being about just 'making things' then perhaps opportunities should be maximised to turn the tired stereotype of 'good with the hands' onto its head and to articulate how all students benefit from, and can celebrate their learning through, rich D&T practice. We know that such practice challenges (positively) students of any ability and all aspects of literacy can be both utilised (literacy's service to D&T) and advanced (as D&T's service to literacy).

'Language, it would seem, is an essential requirement of design' (Hope, 2009:53). Such findings begin to open up the possibilities for congruence of D&T practice with literacy practice at large. Non-linguistic communication and representation genres are well-respected givens in D&T learning environments but they are only part of the palette of literacies that are available to D&T practitioners.

The place of speaking and listening within literacy theory and practice

Whilst common understandings of (language-based) literacy might embrace the interplay of reading, writing, speaking and listening skills, the four constituents are attributed differing values no matter what the realm of research, practice, policy or public usage. There exists something of a hierarchy which pairs 'reading and writing' over 'speaking and listening' and, within these, reading over writing and speaking over listening. In avoiding simplification and reductionism it is important to be aware of contestations within the research of literacy. For example, Smith describes the position of listening as 'the poor relation of speaking, mute and passive by contrast to the active, dynamic creativity of speech.' (Smith, 2010:149)

We have explored some illustrative samples of literature on listening and there is a strong critical current along with more orthodox appreciations. Jones (2011) shows how listening is:

....a multidimensional construct that consists of a) cognitive processes, such as attending to, understanding, receiving, and interpreting messages; b) affective processes, such as being motivated and stimulated to attend to another person's messages; and c) behavioural processes, such as responding with verbal and non-verbal feedback (eg backchanneling, paraphrasing).
(Jones, 2011:85)

In poor quality education, listening is often seen as little more than the vehicle to information retention but Bostrom (2011) points out that studying 'listening as memory' is problematic and argues that 'Listening should be considered as a broad field rather than as a single ability or skill.' (Bostrom, 2011:85). Meanwhile, Burleson (2011) shows how listening can '...be understood both as a mindful (controlled) and a mindless (automatic) process and thus invites a dual-process analysis of listening.' (Burleson, 2011:27)

A group of US researchers (Beall et al., 2008) comment on the breadth of the spectrum of listening research over the last 80 years. They flag early common practices of research into the *amount of time spent listening*, and subsequently on students' *comprehension of oral material*. However, their interest is in *educating students about* listening: 'Listening instruction is especially scarce in primary and secondary schools notwithstanding the fact that listening is linked to both literacy and academic success.' (Beall et al., 2008:123).

When, for example, the powerful pedagogical tool of questioning is considered (drawing on the work of Winkelmann and Hacker [2010] and Smith & Higgins [YYYY]), *sophisticated question-answering technique* warrants a particular place in D&T. Consideration of the pedagogical purpose in each of 'what', 'why' 'how' in establishing knowledge, generating discussion, eliciting thoughts in D&T practices of analysis, scenario-building, description, and justification all matter. Winkelmann and Hacker (2010:306) distinguish amongst '...explanation-, reason- and evaluation-evoking question techniques...' and they discuss the place of each *within* or *after* engineering design problem-solving activity. To these authors, *question-based reflection* is a significant matter.

Core to the efficacy of D&T as enhancer of speaking and listening skills is *D&T's pedagogical practice*. Well-taught D&T demands a rich pedagogical repertoire of its teachers if its own literacies as well as orthodox literacy are to be addressed. Opportunities for listening and speaking skill development through D&T project teaching are many. Some examples might be:

- Design advocacy and defence – where students justify, explain, and reason their design decision-making and choices
- Personal narrative approaches offering description of personal design journeys
- Research strategy explanation
- Critiquing of their own and others' works
- Design explorations through 'community of inquiry' approaches (a rich speaking and listening technique refined by the Philosophy for Children movement)
- Issues engagement – debating and exploring matters on which there is no universal agreement such as sustainability, waste, environment, emergent technologies, wants-needs issues, etc.
- Using design's 'no right answers' ethos which calls for negotiation, reflection, discourse and discussion.

The opportunities for D&T to celebrate different genres of speaking and listening are many and they can happen with a range of audiences and settings: privately to a recording device; between self and peers, or teacher; to the whole class; in other subject settings; to visitors; to assembly; and so on.

D&T learning advanced through speaking and listening skills need not be constrained to particular

D&T environments. Emergent work on located learning shows that pedagogic space is no longer defined in terms of educational programmes and their attached environments, but in terms of the learner. Mobility of the learner and everyday environments are both active elements in creating pedagogic space (Sprake, 2009).

Speaking and listening can be supported both *overtly* through specific design briefs (one example actually appears in the International Journal of Listening - see Johnson-Curiskis, 2009) and *covertly* via skilful pedagogy. We have drawn on the DfE's own research trawl (DfE: 2011) which includes Gillies and Boyle's (2005) work on the many social and learning benefits of *cooperative learning* including '...use of more sophisticated dialogue/talk; (and) the acquisition of language which is personal, friendly and supportive.' Their commentary offers many exemplars that could readily be found in good quality D&T pedagogical practice.

Given the emphasis placed on the importance of the early development of linguistic skills (Rose, 2009; Ofsted, 2011), it is perhaps unsurprising that a predominance of research centres on early years education. However, although a range of more general early years literature is identified in this review, literature focussing on D&T was rather more limited. Some of this is drawn on in other contexts, for example, Hope (2009), Edwards-Leis (2010) and Antonopoulou, (2011). However there are several pieces of research that offer additional insights significant for D&T practice. A study into the role of explanatory frameworks that support young learners in developing technological and psychological perspectives when 'explaining' (Levy and Mioduser, 2007) is useful in highlighting the complexities of language development in a technological environment. The complex nature of supporting language development is again discussed by (Colfer, 2011) whose study offers useful insights into talk and gender in D&T. She examines learning conversations in the context of research by Eke and Lee (2009) into the difficulty teachers have in capitalising on talk. She explores the role of gender associated language, termed assertive for boys and affiliative for girls, whilst looking at more general aspects of the types of talk children use when engaged in collaborative design and technology. This research again emphasises the importance of the social construction of knowledge in bringing about social and cognitive gains, and the opportunities D&T provides for this.

The D&T Environment as a space for dialogic pedagogy

Dialogic teaching (Kelly, 2007) celebrates pedagogies of reasoning and discussion. In seeking to support the development of speaking and listening skills it is important to view the learning environment as a place where meaningful dialogue, grounded in the experiences of students and teachers, results in new knowledge (Bain, 2010). Participants in learning interactions must be supported in developing a listening culture (Bragg, 2007). Burtleson's (2011) work offers a constructivist perspective on listening skills, where listening is conceptualised as an interpretive skill.

Such an approach resonates with key D&T processes and concepts. Meanwhile, Wegerif et al. (2004) also demonstrate the relationship between reasoning activities, widening access and the promotion of social inclusion – a phenomenon already well met by good D&T practice.

There are many ways in which learners may be given a voice as designers. For example, storytelling, the use of fictional social scenarios to provoke thinking, has proved successful in generating discussions about the design process (Antonopoulou, 2011). Viewing the D&T learning environment as a dialogic space might also mean a role for a social-constructivist approach to learning and the provision of learning opportunities where learners are supported in verbalising their thoughts and feelings (Edwards-Leis, 2010). The literature reveals a number of emergent learning theories of relevance to D&T. In particular, a botanical metaphor, first posited by Deleuze and Guattari in *A Thousand Plateaus* (1987), may offer a more flexible conception of knowledge: the rhizome. In the rhizomatic view, knowledge can only be negotiated, and the contextual, collaborative learning experience shared by social constructivist and connectivist pedagogies is a social as well as a personal knowledge-creation process (Cormier, 2008).

Part of the development of speaking and listening skills might be a dialogic approach to assessment in the D&T learning environment. This type of assessment practice must value and validate the experience students bring to the classroom and importantly, situate this experience at the centre of classroom content and process (Bain, 2010). It must allow students an ontological voice, as well as an epistemological voice and a practical voice (Batchelor, 2006: 787). In order to support development of authentic dialogue the student voice must be given space, audience and influence (Leitch et al, 2005) and integrate assessment as a component of pedagogy that allows for a range of assessment purposes, methods and approaches centred on collaborative and reflexive marking and feedback (Boud and Hawke, 2003; Hounsell, 2007).

Conclusion

We conclude this brief *draft* paper with the following comments and speculations:

- While D&T will undoubtedly have its continuing curriculum battles to fight, it is important to remember that curriculum is usually a matter of evolution. D&T's prime curriculum focus is with educating about the design, about technology and about the designed technological world. But it is a potent player in general education too and we have no doubt it can make a strong contribution to the speaking and listening skills of all students.
- Such a contribution should enhance D&T's status as a significant core subject in the education of all students. It should not compound any thinking of D&T as 'natural place for under-achiever support.'

- There is a large, untapped research potential into the spoken and listened-to in D&T learning environments. Further, there is a ‘research conversation’ to be had between literacy-focussed non-D&T research and research into D&T as an environment of multiple learning genres and mediums (or literacies).
- Design-rich and dialogue-rich pedagogical practices offer many listening- and speaking-skills development opportunities. The extent to which such practices are engaged and refined also warrants research attention. But it must be remembered that ‘...English education lacks a coherent and principled pedagogy.’ (Alexander, 2004:7).
- Design and Technology has a highly defensible role in 21st Century education both as a specialised subject and as a component of every student’s general education. The subject will continue to gain credibility as it shows how it can deliver on the general life skills of all students as well as any other school subject. Such delivery calls for knowledgeable and well-educated teachers who command the necessary pedagogical repertoire. However, the associated knowledge base for this is still developing. Deeper, focussed research is needed to inform the profession, both pre-service and in-service.
- In summary, there is *very strong* potential for D&T to improve pupils’ speaking and listening skills through design-based project work and the key would seem to lie in the *pedagogical approach*.

References

Alexander, R., Armstrong, M., Flutter, J., Hargreaves, L., Harrison, D., Harlen, W., Hartley-Brewer, E., Kershner, R., Macbeath, J., Mayall, B., Northen, S., Pugh, G., Richards, C. and Utting, D. (2009), *Children, their World, their Education: Final Report and Recommendations of the Cambridge Primary Review*, Routledge, London.

Antonopoulou, A., (2011), ‘Story-making in designing and learning’, in Stables, K., Benson, C. & de Vries (Eds.), *Proceedings of PATT25 & CRIPT8 Conferences, London: Perspectives on Learning on Design & Technology Education*, 2011, pp14-23.

Alexander, R., (2004), ‘Still no pedagogy? Principle, pragmatism and compliance in primary education’, *Cambridge Journal of Education*, Vol. 34, No. 1, pp. 7-33.

Bain, J., (2010) Integrating student voice: assessment for empowerment’, *Practitioner Research in Higher Education*, Vol. 4, Issue 1, pp. 14-29.

Batchelor, D. (2006) *Vulnerable Voices: An examination of the concept of vulnerability in relation to student voice*, *Educational Philosophy and Theory*, 38 (6), 787-800.

Beall, M.L., Gill-Rosier, J., Tate, J. & Matten, A., (2008), ‘State of the context: Listening in education’ in *International Journal of Listening*, Vol. 22, Issue 2, pp.123-132.

Bostrum, R.N., (2011), ‘Rethinking conceptual approaches to the study of “listening”’ in *International Journal of Listening*, Vol. 25, Issue 1&2, pp.10-26.

Boud, D. and Hawke, G. (2003) *Changing Pedagogy: Vocational Learning and Assessment*, The Australian Centre for Organisational, Vocational and Adult Learning (OVAL), Research Working Paper, 03-17 (4).

Bragg, S., (2007), ‘ “It’s not about systems, it’s about relationships”: Building a listening culture in a primary school’ in (Eds.) Thiessen, D. & Cook-Sather, A., *International Handbook of Student Experience in Elementary School*, Section Three, pp.659-680.

Burleson, B.R., (2011), ‘A constructivist approach to listening’ in *International Journal of Listening*, Vol. 25, Issue 1&2, pp.27-46.

Colfer, C. (2011), ‘What types of talk are boys and girls using when engaged in a collaborative design and technology task?’ in Stables, K., Benson, C. & de Vries (Eds.), *Proceedings of PATT25 & CRIPT8 Conferences, London: Perspectives on Learning on Design & Technology Education*, 2011, pp113-127.

Cormier, D. 2008. Rhizomatic knowledge communities: Edtechtalk, Webcast Academy. [Weblog entry, February 29.] <http://davecormier.com/edb/2008/02/29/rhizomatic-knowledge-communities-edtechtalk-webcast-academy/> (accessed June 27, 2011).

Dakers, J.R., (Ed.) (2006), *Defining Technological Literacy: Towards an epistemological framework*, Palgrave Macmillan, Basingstoke.

Deleuze, G., and F. Guatarri. 1987. *A thousand plateaus: Capitalism and schizophrenia*. London: University of Minnesota Press.

Department for Children, Schools and Families, (DCSF), (2009), *Independent Review of the Primary Curriculum: Final Report*, DCSF Publications, Nottingham, UK. URL: <https://www.education.gov.uk/publications/standard/publicationDetail/Page1/DCSF-00499-2009>

Department for Children, Schools and Families (2010) *Developing Functional skills in design and technology*, DCSF Publications: Nottingham

Department For Education (2011a), URL: <http://www.education.gov.uk/schools/toolsandinitiatives/nationalstrategies>

Department For Education (2011b), URL: <http://www.education.gov.uk/search/results?q=speaking+listening>

Department for Education and Skills (DFES), (2007), *Improving Speaking and Listening Skills*, DFES Publications, Nottingham.

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/>

Eke, R. and Lee, J. (2009), *Using Talk Effectively in the Primary Classroom*, Routledge: Oxon.

Gillies, R. M. & Boyle, M., (2005), ‘What role does communication play in co-operative learning?’ in *Asia-Pacific Journal of Teacher Education* (2005) Vol 33.3 pp243-259.

Hope, G., (2009), ‘Beyond Knowing How to Make it Work: The conceptual foundations of designing’, in *Design and Technology: An International Journal*, 2009, Vol. 14, No.1, pp.49-55.

Hounsell, D. (2007) Towards More Sustainable Feedback to Students, in D. Boud and N. Falchikov (eds.) *Rethinking Assessment in Higher Education: Learning for the longer term*, Abingdon: Routledge, pp.101-113.

Johnson-Ciriskis, N., (2009), 'Importance of effective listening infomercial' in *International Journal of Listening*, Vol. 23, Issue 2, pp.167-170.

Jones, S. M., (2011), 'Supportive Listening' in *International Journal of Listening*, Vol. 25, Issue 1&2, pp.85-103.

Keirl, S., (1999), 'The fruits of Technological Literacy: Wild varieties or crops of mass production' in (eds.) Benson, C. & Till, W., (1999), *Proceedings of Second International Primary Design and Technology Conference*, CRIPT, University of Central England, Birmingham.

Keirl, S., (2006), 'Ethical technological literacy as democratic curriculum keystone' in (Ed.) Dakers, J.R., (2006), *Defining Technological Literacy: Towards an epistemological framework*, pp 81-102, Palgrave Macmillan, Basingstoke.

Kelly, S., (2007), 'How does classroom discussion affect students' learning?' in *Social Psychology of Education* (2007) Vol. 10, 00 331-352

Levy, S. and Mioduser, D., (2008) 'Does it "want" or "was it programmed to..."? Kindergarten children's explanations of an autonomous robot's adaptive functioning', *International Journal of Technology and Design Education* 18:337-359

Leitch, R., Lundy, L., Clough, P., Galanouli, D. and Gardner, J. (2005) *Consulting Pupils on the Assessment of their Learning (CPAL)*, Paper presented at the 6th Annual Conference of the Teaching and Learning Research Programme, Warwick, UK, 28-30 November 2005. URL: <http://www.leeds.ac.uk/educol/documents/156990.htm>

Lewis, T., & Gagel, C., (1992), 'Technological Literacy: a critical analysis' in *Journal of Curriculum Studies* 1992:24:2:117-138

National Literacy Trust (2010) URL: <http://www.literacytrust.org.uk/>

New London Group, The (1996), 'A Pedagogy of Multiliteracies: Designing Social Futures', in *Harvard Educational Review* Spring 1996:66:1:60-92

OfSted, (2011) Summary: Removing barriers to literacy. URL: <http://www.ofsted.gov.uk/publications/090237>

Petrina, S., (2000), 'The Politics of Technological Literacy' in *International Journal of Technology and Design Education*, 10, 181-206.

Smith, R., (2010), 'Half a language: Listening in the city of words' in *Educational Research* 1, Vol.4, Educational Research: Proofs, Arguments, and Other Reasonings, pp149 – 160.

Smith, H. & Higgins, S., (2006), 'Opening classroom interaction: the importance of feedback', *Cambridge Journal of Education*, Vol. 36, No. 4, pp. 485-502

Sprake, J., (2009), 'Designing Participant-Generated Context into Guided Tours', *International Journal of Mobile and Blended Learning*, 1(2), pp. 19-38.

Wegerif, R., Littleton, K., Dawes, L., Mercer, N., & Rowe, D, (2004), 'Widening access to educational opportunities through teaching children how to reason together' in *Westminster Studies in Education*, Vol. 27, No.2.

Winkelman, C. & Hacker, W., (2010), 'Question-answering technique to support freshman and senior engineers in processes of engineering design' in *International Journal of Technology and Design Education*, (2010) 20:305-315.

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