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A Literature Review in Search of an Appropriate Theoretical Perspective to Frame a Study of Designerly Activity in Secondary Design and Technology

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Abstract

This paper explores how literature in which socio-cultural theory is applied to learning (John-Steiner, 1985; John-Steiner, 2000; Vygotsky, 1978) can be used to frame a study of designerly activity in a secondary design and technology classroom. Having established the theoretical underpinnings of the study, the paper goes on to develop an appropriate research question, methodology and analytical framework, all of which are justified against the theoretical perspective. The paper concludes by explaining how the approach could be applied to studies in other areas of the curriculum.

Keywords

social constructivism, socially, culturally, designerly, interaction, collaborative learning

Introduction

The aim of this paper is to show how literature in which socio-cultural theory is applied to learning (John-Steiner, 1985; John-Steiner, 2000; Vygotsky, 1978) can be used to frame a study of designerly activity in a secondary design and technology classroom.

To achieve this aim the paper is divided into three parts. The first part will consider theories of learning that promote the idea that understanding is constructed socially and culturally (John-Steiner, 1985; John-Steiner, 2000; Vygotsky, 1978). The second part describes exactly what will be investigated during the research project. The third part will consider the theories drawn from the relevant literature that will be used to analyse the data collected during the study. The conclusion will outline the emerging analytical assumptions established as a result of the literature review and explain how the approach could be applied to studies in other areas of the curriculum.

Theories of learning that promote the idea that understanding is constructed socially and culturally

In educational theory a constructivist approach to learning as advocated by Piaget (1950), focuses exclusively on the meaning making of the individual mind. In my view and that of others (Hamilton, 2003; Hamilton, 2004; Hennessy & Murphy, 1999; Murphy & Hennessy, 2001) the nature of designing within the design and technology classroom is a social activity drawing on interaction between pupil/pupil and pupil/teacher. As such it moves beyond constructivism to social constructivism which depends on a view of education that places language and interaction at the heart of the learning process. Previous studies, (Murphy & Hennessy, 2001) have shown that pupils seek opportunities to interact with peers even when these are not made explicit by the pedagogic stance adopted by the teacher. This view of learning as a socially mediated activity draws on the work of Vygotsky (1978: 90), who believed that "learning awakens a variety of internal development processes that are able to operate only when the child is interacting with people in his environment and in co-operation with peers".

Throughout this study, I will rely on Vygotsky's cultural historical ideas that creative activities (e.g. designing) are social, and that thinking is not confined to the individual brain/mind. In this context pupils are co-constructing their knowledge and meaning making (Hamilton, 2003). John-Steiner (2000:40), clarifies this point further by explaining that in partnerships as in the case of collaborative designing, 'we broaden, refine, change, and rediscover our individual possibilities'. Generative ideas emerge from joint thinking and significant conversations, as in those which take place when the pedagogic stance of the teacher supports collaborative enquiry with the interdependence of thinking leading to the co-construction of knowledge.

John-Steiner (2000) highlights through examples such as Einstein's preference for visual and kinaesthetic modes of thinking, Bohr's reliance on thinking through words (verbal cognition) and Heisenberg's mathematical expression of thought processes that individuals favour different modes of cognition and that the collective contributions of divergent thinkers can add value to creative development as contributors draw on their 'complimentarity of skills' (John-Steiner, 2000).

The interdependence of socio-cultural contexts and individual physical and mental development on the one hand, and the analysis of meaning and the ways it develops in human social interaction on the other, are the core of Vygotskys' theoretical

framework. Vygotsky (1978) posed questions such as: (a) What are the children doing? (b) How are they to satisfy task demands? In this research study, I will look closely at what pupils (and their teacher) do and say when they are designing and how the outcomes of the pupil's designing develops in order to answer the following research question: What are the features of the classroom interactions that support pupil's design activity?

In my theoretical framework, based on Vygotsky's work the development of effective designerly activity is seen as occurring first in the shared activities of individuals, particularly between young and mature designers i.e. the pupil and their teacher, in turn this is transformed into inner understanding and further into designerly thinking. Young designers appropriate socially elaborated symbol systems. In a designerly context this would include relevant dialogue, the use of scaffolded sketching where the act of sketching becomes the centrepiece of designerly conversation with sketching used as a tool to develop a mutually appropriated concept, or as Schön (1983: 78) puts it 'a conversation with the materials of a situation' through the iterative development of the design idea. Individual and social designerly processes are unified through dialectical synthesis, frequently referred to as the 'zone of proximal development' (Vygotsky, 1978; 1981; 1986).

According to Vygotsky (1978; 1981; 1986), all specifically human mental processes (so-called higher mental processes) are mediated by psychological tools such as language, signs, symbols. For instance, when designing collaboratively verbal and visual discourse between individuals, particularly inexperienced and experienced speakers, is transformed into inner speech and further into designerly thinking and external designerly activity thus producing (building on Vygotskys' theory of the zone of proximal development) what could be termed as the zone of designerly proximal development.

A description of the proposed Study of Designerly activity in Secondary Design and Technology

In recent years Mike Ive (ex HMI subject adviser for design and technology) repeatedly used the term "neat nonsense" to describe the undue time and effort given by many pupils (and teachers) to the presentation of design folios at the expense of content. Parker (2003:7) echoed this when he gave his personal perspective on the issues based on his experience as both an Office for Standards in Education Inspector and a Local Education Authority advisor:

> To a large extent, the tail wags the dog. Teachers are reluctant to change their practices when they have established strategies to ensure their A* to C grades each

year. GCSE coursework assessment procedures discourage teachers from breaking the mould. They seem more typically to reward those students who can jump through the assessment hoops rather than encouraging those who are able to show real flare and imagination. The development of creativity in students, the opportunity for them to propose imaginative solutions, take risks, be intuitive, inventive, and innovative in their work, has been sidelined by an approach which has become far too mechanistic.

This lack of creativity in the design and technology classroom has been noted by others (Hamilton, 2003; Kimbell, 2000; Spendlove, 2005). The 2002/03 Ofsted subject report, '*Design and technology in secondary schools*' (Office for Standards in Education, 2004), went further by drawing attention to the lack of progression in designing skills.

Typically a school would attempt a sequence of designing and making assignments during Key Stage 3 (11–14 years) and pupils would expect to be able to take home a product from each assignment. However, teachers of design and technology in England have been challenged to improve the teaching of the sub-skills of designing through the introduction of the Key Stage 3 Design and Technology Framework (Department for Education and Skills, 2004). With the Key Stage 3 Framework now in the public domain and design-without-make advocated as a method of improving designing skills, it is timely to study this pedagogic approach in order to further inform and support developments. This approach is a fundamental challenge to existing pedagogy which traditionally relies on pupils designing, making, testing and evaluating products across a range of material areas, namely food, textiles, resistant materials and systems and control.

Having acknowledged that the study will be framed by and contribute to socio-cultural theory, I have been able to make a number of decisions about the nature of the study. In this instance a 'case study approach bounded by time and focus group' (Cresswell, 1998) will be conducted in a design and technology department which runs a design-without-make unit of work for all Year 9 (13/14 year old) pupils. The design-without-make unit is based on Young Foresight (Barlex, 1999). This is a recent design and technology initiative in England. It challenges orthodox approaches to teaching design and technology which rely on design and make assignments, focussed practical tasks and product analysis exercises in the following ways:

1 pupils design but do **not** make;
2 pupils design products and services for the future;
3 pupils use new and emerging technologies in their design proposals;

4 pupils write their own design briefs;

5 pupils work in groups;

6 pupils present their proposals to their peers, teachers and mentors and to adult audiences at innovation conferences.

The Young Foresight approach has been chosen as the starting point for the unit of work as it advocates the collaborative development of design ideas. This provides an excellent opportunity to research designerly activity as a socially mediated process and the social constructivist view of the co-construction of knowledge.

Theories drawn from the relevant literature that will be used to analyse the data

Having decided upon the research question: *What are the features of the classroom interactions that support pupil's design activity?* it is clear that the question calls for an analysis of process and extensive observation, both of which were core elements of Vygoskys' analytical framework and will be vital components of this study. In order to enable the process to be analysed in-depth video and audio data will be collected from a number of lessons for the duration of the design-without-make unit of work. Extensive analysis of classroom interactions will be enabled by focussing on the actions of four purposively sampled pupils and their teacher. The data will be transcribed and placed in a table to facilitate fine grained analysis.

Categories of analysis will be derived from a number of sources. The first source will be the Vygoskian literature and will include concepts such as scaffolding and mediation. There are a great number of different forms of adult mediation, from the adult's presence, which provides the child with a secure learning environment, to encouragement, challenge, and feedback (Schaffer, 1996). Tharp and Gallimore, (1988) wrote about such forms of teacher mediation as modelling, contingency management (praise and critique, feedback, and on the other level, cognitive structuring). Fine grained analysis of the video transcripts will move beyond description to explanation in an attempt to highlight effective forms of mediation and scaffolding. In addition the data will be analysed in order to discuss how the teacher can establish an educational environment in which 'a zone of proximal development' Vygotsky (1978; 1981; 1986) can exist, as it is in this environment that learning and development take place. The data will be analysed with a view to ascertaining the features of the 'learning conversations' (Hamilton, 2003) which facilitate the development of designerly activity in pupils. It is anticipated that open questions and other forms of interactive challenge will support this development.

The second source of categories of analysis will be the concept of divergent modes of cognition (John-Steiner 2000) including concepts such as visual, mathematical and verbal modes of cognition.

It is anticipated that further categories will be derived from the data and that these will form part of the analytical framework established to assist in the deconstruction and interpretation of the video data, thus expanding the theoretical framework beyond that of a purely Vygotskian perspective but still framing the study through socio-cultural theory and particularly as a study of social constructivism during designerly activity.

Conclusion

A detailed review of the literature of theories of learning that promote the idea that understanding is constructed socially and culturally has led me to conclude that the study of classroom interactions during designerly activity in secondary design and technology needs to be conducted in a natural setting i.e. the classroom, where social interaction is recorded via video and audio recordings and studied alongside the production of pupils' design work, in order to ascertain the features of the classroom interactions that support pupil's design activity and which form the language of design in fledgling designers i.e. pupils in schools. The term 'fledgling designers' has been developed in order to extend the five levels of expertise (Dorst, 2003), which consist of 'novice', 'beginner', 'competent', 'proficient' and 'expert' to include a category specifically for pupils in schools, who will be designing without having had to show prior aptitude and proficiency in the field.

The data will be analysed through a socio-cultural lens using categories such as scaffolding, mediation and divergent modes of cognition in an attempt to understand more fully the nature of the interactions which take place.

This naturalistic approach would be equally effective in any classroom setting where pupils are encouraged to draw upon social interaction in order to scaffold their learning. Examples include science where pupils work collaboratively on experiments, art where pupils work collaboratively to produce their response to a given brief and media studies where pupils co-construct outcomes such as short films.

It must be acknowledged that the focus of this paper is on the theoretical underpinnings of the proposed study and that future work should be undertaken to establish a wider range of data collection methods drawn from theories related to the nature of designing (Cross, 1989; Dorst, 2003; Ericsson and Simon, 1993; Ericsson, 2001; Lawson, 2004). It should also be shown how these theories compliment socio-cultural

theories and how they can be used side by side to frame the study of classroom interaction during designerly activity.

References

Barlex, D. (1999) *Young Foresight*, London, Young Foresight.

Creswell, J. (1998) *Qualitative Inquiry and Research Design: Choosing among Five Traditions*, London, Sage Publications.

Cross, N. (1989) *Design Methods: Strategies for Product Design*, New York , John Wiley and Sons.

Department for Education and Skills (2004) *Key Stage 3 National Strategy Foundation Subjects: Design and Technology Framework and Training Materials*. London, Department for Education and Skills.

Dorst, K. (2003) 'The problem of design problems'. In *Expertise in Design*. N. Cross and E. Edmonds (eds), Sydney, Creativity and Cognition Studios Press, (pp. 135-147)

Ericsson, K & Simon, H (1993) *A Protocol Analysis: Verbal Reports as Data*, Cambridge, MA, MIT Press.

Ericsson, K. (2001) 'Attaining excellence through deliberate practice: insights from the study of expert performance'. In M Ferrari (ed.) *The Pursuit of Excellence Through Education*, Hillside, NJ, USA, Erlbaum, (pp. 21 - 56)

Hamilton, J. (2003) 'Interaction, dialogue and a creative spirit of enquiry'. In E. W. L. Norman & D. Spendlove (Eds.) *Design Matters: DATA International Research Conference 2003*. Warwickshire, UK: University of Warwick, 35-44.

Hamilton, J. W. (2004) 'Enhancing learning through dialogue and reasoning within collaborative problem solving'. In E. W. L. Norman, D. Spendlove, P. Grover, & A. Mitchell (Eds.). *Creativity and Innovation: DATA International Research Conference 2004*, Sheffield, UK: Sheffield Hallam University, 89-101.

Hennessy, S. & Murphy, P. (1999) 'The potential for collaborative problem solving in design and technology'. *The International Journal of Technology and Design Education*, 9, 1-36.

Kimbell, R. (2000) 'Creativity in Crisis', *The Journal of Design and Technology Education*, 5(3), 206–211.

John-Steiner, V. (1985) *Notebooks of the Mind Explorations of Thinking*, Oxford, Oxford University Press

John-Steiner, V. (2000) *Creative Collaboration*, Oxford, Oxford University Press

Lawson, B. (2004) *What Designers Know*, Oxford, Elsevier Ltd

Murphy, P. and Hennessy, S (2001) 'Realising the potential – and lost opportunities – for peer collaboration in a D and T setting', *The International Journal of Technology and Design Education*, 11, 203-237

Office for Standards in Education (2004). *Design and Technology in Secondary Schools in Ofsted Subject Reports Series*, 2002/03 London, UK: The Stationary Office.

Parker, J. (2003) Weaknesses revealed. In D. Barlex (Ed.), *Creativity in crisis? Design & Technology in KS3 and KS4*, London: The Design and Technology Association/Nuffield Foundation, 6–8

Piaget, J. (1950) *The Psychology of Intelligence*, London, Routledge and Kegan Paul

Schön, D. A. (1983) *The Reflective Practitioner: How Professionals Think in Action*. London, Temple Smith

Spendlove, D. (2005) 'Creativity in Education: A Review', *Design and Technology Education: An International Journal*, 10(2), 9–18.

Tharp, R., & Gallimore, R. (1988) *Rising Minds to Life: Teaching, Learning and Schooling in Social Context*. Cambridge: Cambridge University Press

Vygotsky, L.S. (1978) *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA, Harvard University Press

Vygotsky, L.S. (1981) 'The genesis of higher mental functions'. In J.V. Wertsch (Ed.), *The Concept of Activity in Soviet Psychology* (pp. 144-188). Armonk, NY: Sharpe

Vygotsky, L.S. (1986) *Thought and Language (rev. ed)*. Cambridge, MA: Harvard University Press.