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The Role of Implicit Theories in the Development of Creative Classrooms

Wendy Dow, University of Glasgow, Scotland

Abstract

Whilst there appears to be a consensus that creativity should be encouraged in the school curriculum in general and in the design and technology curriculum in particular, the extent to which this is a reality within the present day system is open to question. Whereas teachers appear to overwhelmingly endorse the desirability of developing creativity within the classroom (Feldhusen & Treffinger, 1975), there appear, paradoxically, to be factors either within individual teachers or within the system which in some instances militate against this.

This paper attempts to explain this problem through an exploration of the literature on creativity. It considers the implications of some of the issues arising from this literature for the successful development of creativity within the design and technology curriculum.

The paper examines the role of the teacher in providing structures within the classroom which may act as facilitators or barriers to creative practice in the design and technology classroom. The complex relationship between creativity and motivation, for example, is explored through some of the findings on the implications of external evaluation, concrete rewards and praise for creative work (Ames, 1992; Deci, 1971; Ryan & Deci, 2000; Amabile, 1986; Lepper & Greene, 1978), and the differing effects of competitive, collaborative and individualistic structures on the creative process. (Johnstone & Johnstone, 1999; Nicholls, 1989). The importance of autonomy, diversity and risk-taking in fostering creativity is explored in relation to the work of Ames (1992) and Dweck (1999), and the extent to which teachers encourage the types of traits which appear to be part of the 'creative personality' is considered in relation to studies such as those by Wallach and Kogan (1974) and Guilford (1959).

It is argued that the extent to which teachers are willing to adopt the type of structures and practices which will foster creativity in the design and technology classroom may be a function, not only of the education system but, perhaps more importantly, of the implicit theories which teachers hold in relation to creative ability in particular and to learning and assessment in general.

The role of Teacher Education Institutions is discussed as a means of addressing these issues.

Introduction

There appears to be a general consensus that the development of creativity is important in education (Feldhusen & Treffinger, 1975). This is particularly true in design and technology education where the design process relies on the development of novel and appropriate ideas. It may be, however, that the extent to which this happens in practice is a function of teacher belief and the influence of this on classroom practice. Teachers who implicitly believe, for example, that creativity is an innate talent possessed by a privileged few, or that teaching concerns control and the passing on of expertise through exposition or demonstration, or that a central tenet of successful learning is reward for success or the avoidance of failure, are likely to set up structures which will hamper the development of creativity. Those who implicitly believe, however, that creativity depends on an environment which values agency, and intrinsic motivation, or that risk taking and errors are an important part of learning, or that challenge is more important than providing the right answer, are more likely to provide the structures where true creativity will flourish. This has serious implications for the education of teachers for the field of design and technology. The study of theories which support the latter structures will not be sufficient unless these accord with implicit theories already held. Unless these underlying, deeply rooted and often unconscious beliefs are made explicit and addressed, they will continue to be evident in action in design and technology classrooms, whatever the academic theories espoused.

Implicit theories

Teacher beliefs appear to be heavily influenced by both personal and professional experience. These beliefs, once generated, create frameworks within which subsequent experiences are constructed.

An important distinction exists between these theories which are constructions in the mind of the individual and academic theories developed through the systematic collection of data by experts in the field. The former have variously been referred to as folk psychology (Bruner, 1966) private theories (Eraut, 1994) tacit theories or theories in use (Argyris and Schon, 1974) personal constructs (Kelly, 1955) and implicit theories, Dweck (1999) and Sternberg (1990). Argyris and Schon suggest moreover that although the espoused theories used to explain action are more likely to be academic



theories, implicit theories are what determine action and may be observed only in action. A design and technology teacher may, therefore, whilst undergoing an inspection, or having a discussion with parents, espouse the theory that teaching towards the exam is a pedagogically flawed model of teaching but at the same time, see no problem in taking pupils off task one month prior to the exams for cramming sessions. The implications for this can be serious. Atkinson (2000:277) reports, for example that ‘...inflexible models provided by teachers during public examinations in Design and Technology, have on the one hand, enabled many pupils to achieve success in terms of performance, whilst on the other hand, they have wasted valuable education opportunities for the development of higher order thinking skills at a crucial stage in a pupil’s education.’

The importance of exploring the impact of implicit theories is further strengthened by Kennedy (1997) who highlights the use of implicit theories in the evaluation of new ideas, an area which has serious implications for design and technology education. Kennedy’s suggestion is that new ideas which are compatible with an existing framework will be easily assimilated, whereas ideas which appear challenging to, or incompatible with the framework will be dismissed. Thus a teacher who implicitly believes that all design solutions must follow a logical sequential pattern will be more likely to overlook or reject any evidence supporting a contrary view.

The role of these intuitive or implicit theories has been investigated in a number of areas directly relevant to the design and technology classroom. Kennedy (1997) suggests, for example, that the types of beliefs held by teachers influence fundamental issues such as the reasons given for variation in academic performance, the role of education, effective pedagogy, and notions of right and wrong. Dweck (1996) has explored implicit theories of personality, and both Dweck (1999) and Sternberg (1990) have investigated the differences between implicit and explicit theories surrounding the construct of intelligence. Sternberg (1985) has also explored these in specific relation to creativity.

Creativity

The complexity and range of theories of creativity can be daunting for the layperson to engage with. All the main schools of psychology for example - psychodynamic, behaviourist, Gestalt, cognitive, and socio-psychological have had contributions to make to the debate about what exactly creativity is and how it can be recognised and fostered.

If, as has been suggested, academic theory in accord with the implicit theory held is more easily accepted, whilst that presenting a challenge is

rejected, then the greater the range of formal theories extant, the greater the opportunity to find reinforcement for already established views. In this way implicit theories may be further strengthened through a form of selective attention. Certain academic theories will be adopted and assimilated into the existing schema for creativity, whilst others are dismissed or overlooked. Theoretical and empirical research into the topic of creativity clearly provides a rich field of disparate views from which to choose. Although theories of creativity are too numerous to deal with in any detail in this paper, the main elements which may impact on the practice of design and technology teachers will be considered.

One important belief pertinent to the development of creativity within the design and technology classroom is the extent to which it is considered, like intelligence, to be either an innate and therefore stable and global trait or a fluid and context related construct which can be developed through experience and education.

Galton’s (1869, 1874) study of genius and Terman’s (1925, 1926) study of the mental ability in childhood of outstanding historical figures, for example, lend credence to the notion that creativity is a “special” phenomenon limited only to the best in any field is promulgated, the assumption being that there is something inherently different about certain people that makes them more likely to excel.

This is clearly contrary to the view espoused in *All Our Futures* (DfEE, 1999:34) which supports the notion that:

‘Creativity is a basic capacity of human intelligence. Human intelligence is not only creative, but multi faceted. It is for this reason that we argue that all young people have creative capacities and they all have them differently’.

However, where a design and technology teacher does not implicitly hold this view, he or she will be unlikely to encourage risk taking in any design endeavour with a pupil who, in the implicit belief system of the teacher, has no creative ability. In this case the teacher is more likely to foster a positive approach only for those deemed to possess inherent creative ability. The teacher who, on the other hand, implicitly believes that all children are capable of creative endeavour is more likely to promote creative endeavour for all.

The notion that there is something qualitatively different about the thought processes of those classed as creative is given further credence by the attempt to define different ways of thinking. One example is the Gestalt psychologists’ distinction



between productive and reproductive thinking (Wertheimer, 1981). In the latter, functional fixedness results in non-creative solutions to problems, whilst in the former, the ability to break rules and think beyond the obvious boundaries of the problem would lead to creative solutions (Mayer, 1989; Duncker, 1945). The notion of insight is also important to such theories which see creative thought as some mysterious power residing within the individual, rather than something which can be taught.

A similar type of distinction was made by Guilford (1959) with the concept of divergent and convergent thinking which again encourages the belief that creativity can be recognised but not taught. If this is the dominant implicit belief held by a design and technology teacher, then that teacher is less likely within the context of the design process 'to provide opportunities for young people to express their own ideas, values and feelings' (DfEE, 1999:33). Kimbell and Perry's (2001:8) notion of creative environments 'packed with opportunities to explore and exploit designerly hunches', are, moreover, likely to be compromised where the implicit belief of the teacher is that creativity is the prerogative of the natural 'divergers' in the class.

Research into the personality correlates of creativity also gives support to the idea that there is something special and different about 'creative' people. The personality traits associated with creativity, however, are generally those which are regarded as undesirable within a classroom context. Getzel and Csikszentmihalyi (1973), for example noted that those labelled 'creative' were considered to have less self control, less concern for social approval and were less likely to conform to socially accepted norms. Mackinnon (1962) found, moreover, that pupils displaying the traits associated with creativity felt that they were disliked by teachers and had more unhappy experiences at school, a finding which has been corroborated more recently by Wetsby and Dawson (1995) who found that teacher descriptions of creative children corresponded closely to those whom teachers most disliked. Such findings have obvious implications for the development of creativity within design and technology.

Some cognitive theories of creativity suggest, on the other hand, that there is nothing qualitatively different about people in relation to creativity, although Weisberg's (1993) contention that it may be difficult for many to accept that creativity in the form of great works of art or breakthroughs in science or technology could be the result of the same cognitive processes involved in more mundane activities, would appear to endorse the impact of implicit theories in this respect.

More recent socio-cultural theories of creativity have stressed the importance of culture and environment in encouraging the prerequisite development of interest and commitment in the domain.

According to these theories it is motivation, the amount of time devoted to a design or problem, perseverance in the face of difficulty, the ability to take risks and independence of thought that are the necessary correlates of creativity. Teachers who adopt this theory are likely to take a very different approach to the development of creativity within the classroom than those who implicitly believe in the importance of personality or innate talent, or who value control and the transmission of knowledge.

Implications for design and technology classroom practice.

The impact of implicit theories on classroom structure has been stressed by Ames (1992). Teachers create structures which will either foster or inhibit creativity according to the implicit theories held about both the nature of learning and the role of creativity within this.

One area of crucial importance in this respect is task design. Tasks which are open ended, which are meaningful and which encourage active involvement and real choice for pupils are essential in design activities. Only with a real element of freedom in choice of task and a sense of control over the process can the conditions necessary for what Csikszentmihalyi (1996) terms 'flow' be attained: a condition where there is total absorption on the work on hand.

Associated with freedom of choice and agency is the provision of sufficient time to develop ideas and to change these as they progress. Research by Csikszentmihalyi and Getzels (1973) indicates, for example, that a person working creatively expends more effort during the early part of the process, rather than quickly narrowing down. There is also a readiness to revise decisions made earlier, with a rejection of the limits that the work carried out so far may impose upon the work to come.

There must therefore be a degree of flexibility built into lessons which will enable pupils to work at their own pace and to make alterations to products as part of an iterative design/manufacturing process. This point is no mere corollary: there is a corpus of research evidence which indicates that a substantial amount of pedagogy in design and technology education is prescriptive, controlled and inconducive to the development of creativity (e.g. Barlex, 2003; Dakers & Doherty, 2003; Harlen & Holroyd, 1996; Kimbell & Perry, 2001; Peters 2002). Research into student teachers' perceptions of the teaching of



design and technology in primary schools in twelve different Scottish local authorities supports this. 'The emphasis on creativity within the design process...appeared to vary markedly from school to school, with many tasks being clearly prescriptive and relying on kits or work cards...' (Dow, 2003:32).

Motivation is a crucial part of any learning and is also central to the development of creativity. Research in the area highlights the particular importance of intrinsic, as opposed to extrinsic motivation in this respect. Studies suggest for example, (Ryan and Deci, 2000; Lepper and Greene, 1978; Amabile, Hennessey, 2000) that external rewards can under some conditions reduce both interest in a task and the degree of creativity evident in the final product. This has important implications for the practice of giving rewards, or even praise for the finished product in design and technology. Ames (1992) suggests, moreover, that even displays of best work can focus attention on the product and thus detract from the process which is of paramount importance in fostering creativity.

Although competition is frequently regarded as a motivating influence in design and technology, with prizes offered by companies for the best design and manufacture of products, a competitive ethos has been found to have a detrimental effect, not only on the intrinsic motivation considered essential for the development of creativity, but also on risk taking and on the creative process itself (Ryan and Deci, 2000; Johnson and Ahlgren, 1976; Nicholls, 1989). Where the focus is on doing better than others, fewer risks are taken and less creative work results.

Whilst collaboration may promote creativity through the provision of opportunities for idea development during the design stage, there is nevertheless some evidence to suggest that creativity, in the final analysis may be an individual process (Csikszentmihalyi and Getzels, 1973). In this case there may be a need to provide sufficient opportunity for pupils, when they choose, to work alone. The type of individualistic working encouraged, however, is again a function of classroom structure. Individualistic structures which encourage social comparison, through the awarding of grades, the comparison of one pupil's work to another, or the selection of 'the best work' for classroom display may have a detrimental effect on children's judgement of both their ability to carry out a task and their intrinsic interest in the task being undertaken. Individualistic structures where children are encouraged to develop their own ideas and to measure progress against previous efforts are more likely to be conducive to a creative, non-competitive classroom ethos.

If implicit theories are formed through experience, then the personal experiences of teachers within the education system have important implications for practice. Implicit epistemological theories may precede and in turn influence implicit theories about the nature of creativity and how it can be fostered within the context of the classroom. This indeed may go some way to explaining why the types of personality traits associated with creativity have not met with unanimous teacher approval. The education system which most teachers will have experienced is likely to have promoted reductionist, behaviourist methods of teaching and learning. Teacher control has traditionally taken precedence over pupil autonomy; the transmission model of learning in which the 'expert' teacher breaks down knowledge into manageable chunks which children learn to mastery level in a sequential manner is still, in many cases considered the most effective way to learn. Indeed the entire rationale behind 'Practical Craft Skills' a subject recently introduced into the Scottish secondary curriculum is based upon just such a premise. Skills are broken down into their component parts, demonstrated by the teacher, practised in unison, then used to produce a prescribed artefact. Each step is tightly controlled. Creativity is sacrificed for ease of teaching.

Although the use of punishment may have given way to the promotion of learning and behaviour through positive reinforcement, the latter is no less behaviourist in its principles. Despite evidence about the detrimental effect of such practices on the creative process, they continue to be the dominant model in schools. Teachers who espouse the importance of fostering creativity, may hold implicit theories of learning which in fact operate in direct opposition to it. The structures they created will reflect this opposition.

Implications for teacher education

Bruner seems to be acutely aware of the impact of implicit theories when he suggests that teacher educators '...had better take into account the folk theories that those engaged in teaching and learning already have.' (Bruner, 1996: 46)

Argyris and Schon (op cit) suggest, moreover, that although implicit theories can be affected by inconsistencies and incongruities between these and espoused theory, they tend, nevertheless to be self maintaining. Thus a design and technology teacher whose implicit theory about creativity is that it is a special quality present only in a tiny percentage of the population, will easily overlook evidence of creativity in all but a very small number of pupils taught. This in turn will have an important effect on pupils through self-fulfilling prophecy. Teachers whose implicit theories of learning are governed by notions of transmission of knowledge and control of



learning will find it hard to create the types of structures which will encourage creativity, however often the importance of these are espoused.

It seems crucial therefore for courses to devise the type of intervention which will encourage student teachers 'to think explicitly about their folk psychological assumptions, in order to bring them out of the shadows of tacit knowledge' (Bruner, 1996: 47).

In order to deconstruct implicit theories of creativity held by student teachers of design and technology, it may first be necessary to deconstruct their overarching theories of effective learning and teaching. Although student teachers are exposed to formal theory during courses, unless this becomes accepted and internalised, it is likely to remain at the level of espoused theory, with ideas which conflict with implicit theories being rejected or ignored.

One way may be to make implicit theories explicit through an in depth exploration of personal past experience of design and technology classes, perhaps using a biographical methodology. In this way assumptions already existing about learning and teaching in the area may be made explicit and open to personal challenge. Thus a student teacher whose experience has been of whole class demonstration and absence of choice in selection of design and material can become aware of the effect that this may implicitly have on his/her own future practice.

By increasing awareness of strategies used to enable implicit theories to remain intact in the face of contradictory evidence, moreover, student teachers may be helped to recognise when these are being used and to adopt strategies which will lead to greater reflection.

Strategies which encourage a critical evaluation of formal theory combined with an in depth exploration of the extent to which there is a match or mismatch with implicit theories held and why this mismatch exists, would aid the development of more reflective practice. The development of critical reflection on action along with what Schon (1991) terms 'reflection in action', may also help address conflicts between formal and implicit theory. Analysis of examples of action where tutor and student discuss the effect of action and the effect of implicit theories on classroom structures may be another way ahead.

Whatever interventions are developed it is clear that unless student teachers are encouraged to reflect in depth upon the assumptions that they hold in relation to teaching and learning (and thereby to creativity) in the field, the barriers which exist in relation to its full development in some design and technology classrooms seems likely to remain.

References

- Amabile, T., Hennessey, B. & Grossman, B, (1986), 'Social Influences on Creativity: the Effect of Contracted-for Reward', in *Journal of Personality and Social Psychology*, 50,14-23.
- Ames, C, (1992), 'Classrooms: Goals, Structures and Student Motivation', in *Journal of Educational Psychology*, 84,3, 261-271.
- Argyris, C. & Schon, D, (1974), *Theory in Practice: Increasing Professional Effectiveness*, Jossey-Bass Publishers, San Francisco.
- Atkinson, S, (2000), 'Does the need for High Levels of Performance Curtail the Development of Creativity in Design and Technology Project Work', in *International Journal of Design and Technology Education*, 10, 3, 255-281.
- Barlex, D, (2003), *Creativity in Crisis, Design and Technology at KS3 and KS4*, Design and Technology Association, Warwickshire.
- Bruner, J, (1996), *The Culture of Education*, Harvard University Press, Cambridge, MA.
- Csikszentmihalyi, M. (1996), *Creativity: Flow and the Psychology of Discovery and Invention*, Harper Collins, New York.
- Csikszentmihalyi, M.& Getzels, W, (1973), 'The Personality of Young Artists: an Empirical and Theoretical Exploration' in *British Journal of Psychology*, 64,91-104.
- Dakers, J., Doherty, R. (2003), 'Technology Education', in Bryce, T. & Humes, W. (eds), *Scottish Education*, Edinburgh University Press, 611-616.
- Deci, E, (1971), 'Effects of Externally Mediated Rewards on Intrinsic Motivation', in *Journal of Personality and Social Psychology*, 18,105-115.
- DfEE, (1999), *All our Futures: Creativity, Culture & Education*, National Advisory Committee on Creative and Cultural Education, DfEE Publications, Suffolk.
- Dow, W, (2003), 'Student Teachers Perceptions of Technology Teaching in Scottish Primary Schools' in C. Benson, M.Martin & W.Till (eds.), *Proceedings of the Fourth International Design and Technology Conference*, Birmingham.
- Duncker, K.(1945), *On Problem Solving*, Psychological Monogr., 58, No. 270
- Dweck, C. (1996), 'Capturing the Dynamic Nature of Personality' in *Journal of Research in Personality*, 30, 348-362



- Dweck, C. (1999), *Self-Theories, Their Role in Motivation, Personality and Development*, Psychology Press.
- Eraut, M. (1994), *Developing Professional Knowledge and Competence*, Routledge Falmer.
- Feldhusen, J. & Treffinger, D. (1975), *Teachers' Attitudes and Practices in Teaching Creativity and Problem Solving to Economically Disadvantaged and Minority Children*, Psychological Reports, 37, 1161-62.
- Galton, F., (1869), *Hereditary Genius*, Macmillan, London.
- Galton, F. (1874), *English Men of Science: their Nature and Nurture*. Macmillan, London.
- Getzels, W. and Csikszentmihalyi, M. (1976), *The Creative Vision: a Longitudinal Study of Problem Finding in Art*. Wiley, New York.
- Guilford, J. (1956), 'The Relation of Intellectual Factors to Creative Thinking in Science', in C.W. Taylor (ed.), *The Identification of Creative Scientific Talent*. University of Utah, 69-95.
- Guilford, J. (1959), Traits of Creativity in H. Anderson (ed), *Creativity and its Cultivation*. Harper, 1959, 142-61.
- Harlen, W., Holroyd, C. (1996), *Primary Teachers' Understanding of Concepts in Science and Technology*, Interchange No. 34, Research and Intelligence Unit.
- Hennessey, B. (2000) 'Rewards and Creativity' in C Sansone & J. Harackiewicz, (eds) *Intrinsic and Extrinsic Motivation*, Academic Press, 55-78.
- Johnson, D. & Ahlgren, A. (1976), 'Relationship Between Students' Attitudes about Cooperation and Attitudes Towards Schooling' in *Journal of Educational Psychology*, 88, 3, 92-102.
- Johnson, D. & Johnson, R. (1999), *Learning Together and Learning Alone: Cooperative, Competitive and Individualistic Learning* (Fifth edition) Allyn and Bacon.
- Kelly, G. (1955), *The Psychology of Personal Constructs* (Vols. 1-2) Norton, New York.
- Kennedy, M. (1997), *Defining an ideal teacher education programme (mimeo)*. Washington DC: National Council for the Association of Teacher Education.
- Kimbell, R., Perry, D. (2001), *Design and Technology in a Knowledge Economy*, Engineering Council, London.
- Lepper, M. & Greene, D. (1978), *The Hidden Cost of Rewards*, Lawrence Erlbaum, Hillsdale, N.J.
- MacKinnon, D. (1962), 'The Personality Correlates of Creativity: a Study of American Architects' in G.S. Neilson (ed.), *Proceedings of the Fourteenth Congress on Applied Psychology*, 2, 11-39 Excerpted in P.E. Vernon (ed.) *Creativity*, Penguin Books, Harmondsworth, 289-311.
- Mayer, R. (1989), *Thinking, Problem Solving, Cognition*, Freeman, New York.
- Nichols, J. (1989), *The Competitive Ethos and Democratic Education*, Harvard University Press, Harvard.
- Peters M A (2002), 'National Education Policy Constructions of the 'Knowledge Economy: Towards a Critique' in *Journal of Educational Enquiry*. 2, 1, 2001.
- Ryan, R. & Deci, E. (2000), 'When Rewards Compete with Nature: The Undermining of Intrinsic Motivation and Self Regulation' in C Sansone and J. Harackiewicz, (eds) *Intrinsic and Extrinsic Motivation*, Academic Press, 13-54
- Schon, D. (1991), *The Reflective Practitioner: How Professionals Think in Action*, Aldershot, Ashgate Arena.
- Sternberg, R. (1985), 'Implicit Theories of Intelligence, Creativity and Wisdom' in *Journal of Personality and Social Psychology*, 49, 3, 607-627.
- Sternberg, R. (1990), *Metaphors of Mind: Conceptions of the Nature of Intelligence*, Cambridge University Press, Cambridge.
- Terman, L. (1925), *Genetic Studies of Genius, Vol. 1 Mental and Physical Traits of a Thousand Gifted Children*, Stanford University Press, California.
- Terman, L. & Cox, C. (1926), *Genetic Studies of Genius, Vol. II. The Early Mental Traits of 300 Geniuses*, Stanford University Press, California.
- Wallach, M. & Kogan, N. (1966), *Modes of Thinking in Young Children: A Study of the Creativity-Intelligence Distinction*, Holt, New York.
- Weisberg, R. (1993), *Beyond the Myth of Genius*, New York, Freeman.
- Wertheimer, M. (1981), *Productive Thinking*, Tavistock, London.
- Wetsby, E.L & Dawson, V.L (1995), 'Creativity: Asset or Burden in the classroom?' in *Creativity Research Journal*, 8, 1-10.

