How do I learn to inspire and support my primary education students' creativity in design and technology?

Finding the courage to move from craft to creativity in primary design and technology

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Abstract

In this paper I give an account of an action enquiry I undertook from 2006–2008 as a higher education-based senior lecturer in primary design and technology. I work with students in Initial Teacher Education who are training to be teachers of children aged between 5 and 11 years. The purpose of my research was to find ways of developing new, more supportive pedagogies that would encourage students' independent creativity, and enable them to move from a safe practice of reproducing products, for which I use the term 'craft', towards a more risky practice of creating original designs. This, I recognise, was a challenging venture for me as many of my Primary education students had little opportunity in their previous educational experience to develop their innovative, creative skills and frequently preferred to look to me as an 'expert' supplier of ready-made solutions rather than inventing their own. Yet I persisted in my efforts to live my values of independent and courageous enquiry in the interests of a more enlightened educational experience for all, which, I am pleased to report, was successful, as I go on to explain.

Keywords: Creativity; Primary Design and Technology; Initial Teacher Education; Supportive Pedagogies.

1.   Introduction

My research was inspired by my belief that, as people, we can learn by experience (Habermas as cited in Finlayson, 2005) and can construct our own creative ways of knowing (McNiff and Whitehead, 2006 p.24) which can have an emancipatory influence in our capacity to question previously held ideas and move forward in our learning. As a reflective practitioner I try continually to improve my practice and by undertaking this research enquiry I aimed to develop my own living educational theory about my practice (Whitehead, 1989). I was fortunate in that a group of primary education colleagues were also undertaking their own action research enquiries concurrent with mine and we met frequently as a group to share and critique our work in a community of practice (Wenger, 1998). I presented my on-going research to my critical friends who critiqued my work and provided valuable feedback such as the importance of me clarifying what creativity means in the context of primary design and technology and in helping me make decisions about what data would be useful to collect to support my claim to knowledge. They also acted to validate my claims to knowledge. This was an important aspect of my enquiry, the validity of which hinged around my being able to test the validity of my emergent claims to knowledge against the critical feedback of educated and knowledgeable others.

I now outline some of the key aspects of my research story. I begin with a consideration of my methodology.

2.   Methodology

The methodology I adopted for this research draws on Schön's (1995) observation about knowing-in-action and the contribution to new forms of theory by making explicit the tacit knowledge gained from reflection-in-action to inform reflection-on-action (Ghaye and Ghaye, 1998). I agree with Archer's (1992, p.12) suggestion that a designerly approach (Benson, 2005), where real solutions are sought for real situations, is the most suitable methodology for design and technology research; and so I am developing pedagogies grounded in dynamic epistemologies in a process where my students and I are co-creating knowledge. My ontological position informs the entire research process as I study my emerging practice, identifying my educational influence on my students' creative development and their influence on my professional perspectives as we generate our individual and collective living theories of practice (Whitehead and McNiff, 2006, p.32).

In reflecting on my practice I have made judgements based on my desire to live my values of respect, freedom and social justice through a supportive pedagogical practice; and I have used these values as living criteria and standards to judge the quality of my enquiry. I have reflected on my existing practice, considered my concerns, envisaged possible solutions and conducted a systematic enquiry to test out ideas about ways to improve.

Throughout I have adopted an educational action research methodology (McNiff and Whitehead, 2006) whose underpinning emancipatory values were commensurate with my ontological and epistemological stance, and have used a series of questions to outline my enquiry as follows:

- What was my concern?
- Why was I concerned?

- How did I show the situation as it was and how it unfolded?
- What data did I gather?
- What could I do? What did I do?
- What was the outcome?
- How did I ensure that any conclusions I came to were reasonably fair and accurate?
- What is the potential significance for my learning, for the learning of others and for the wider community?
- How will I modify my concerns, ideas and practice in the light of my evaluation?

These questions also form the section headings for organising the contents of this paper.

My claim to knowledge is that by teaching in a more emancipatory style (Freire, 1970) that celebrates people's capacity for originality of thinking, I have enabled my students to begin to externalise their implicit knowledge, develop their tacit creativity and challenge their normative assumptions about educational relationships.

I now outline the steps in my action enquiry.

3.   What was my concern?

I support Pitt's idea (2006, p. 1) that children are naturally creative and Baynes' belief that people are pre-disposed to design, to 'explore and change their environment' (Baynes, 1992, p.18). The Department for Education and Skills (DfES) document, *All Our Futures: Creativity, Culture and Education*, maintains '… that we are all, or can be, creative to a lesser or greater degree if we are given the opportunity' (Department for Education and Skills, 1999a). This natural capacity for imagination (Bronowski, 1973, p.19) needs to be fostered in order to develop. I also believe in Magaluzzi's advice to 'stand aside for a while and leave room for learning' (cited in Keyte-Hartland, 2006) and yet have often found myself using a delivery style of teaching in direct opposition to these recommendations. By previously adopting a didactic pedagogical style to meet the perceived demands of the Teaching and Development Agency (TDA) I had begun to experience myself as a living contradiction (Whitehead, 1989) because my belief in individuals' capacity for infinite acts of creativity was being denied in my practice.

My concerns were further deepened, because I realised that my primary education students come from an assessment-led schools culture in which exams and testing, mainly of propositional knowledge, was a part of their educational experience from the age of seven. Design and technology is widely recognised as a curriculum area that welcomes risk taking; consequently, failure is expected as part of working towards improvement and developing individual unique solutions. I wanted to encourage students to move away from 'craft' with its emphasis on recreating existing objects (Butterworth, 2006) to design and technology, where originality, user and purpose (Spendlove, 2005) are key considerations in developing creativity together with 'The courage to let go of certainties' (Fromm 1956, p.21), in order to be 'autonomous and creative problem solvers … And become innovators' (Department for Education and Skills, 2004, p.15).

If my students develop a practice that does not challenge their normative assumptions of an assessment-led, transmission form of pedagogy, then creativity in their classrooms could be stifled and the quality of learning experience for them as teachers and the children they teach could be greatly reduced. 'Uniquely, design and technology *empowers us to change the made world*' (Kimbell and Perry, 2001, p.3) and is fundamental to the 'future wellbeing of society' (Qualifications and Curriculum Authority, 2004) and a sustainable future.

Another concern is that my students seldom challenge my role as the source of knowledge, whereas I try to take a participative pedagogical position within the learning group to encourage shared learning. Students frequently ask for plans and instructions to make existing products. Whilst I recognise the need for focussed practical tasks to develop skills and knowledge I also identified a need to develop pedagogies that encouraged a 'trial and error' approach at times. Consequently, I endeavoured to move from the situation of 'teacher and taught' to a position where we are all 'simultaneously teachers and students' (Freire, 1970, p.59), inspired by my recognition that in creating designs and products we are also creating knowledge. I draw on Sfard's (1998) two metaphors for learning, as requiring both the 'acquisition' of knowledge and a process of 'participation' in knowing and understanding. I am concerned about educational approaches that rely too strongly on acquiring knowledge as a collection of facts without recognising the importance of the process of participating in learning, including practical experiences and reflective meta-cognition. Reflection, modification and perseverance are essential for success, and young people need help in recognising their own abilities and opportunities to develop them in their own way.

My research enabled me to respond to needs identified by previous students' evaluations which had revealed my tendency to focus largely on providing propositional knowledge-led courses. I prepare students to teach the National Curriculum (Key Stages 1 and 2) subject knowledge and skills (Department for Education and Skills, 2004, p.15). I recognised a need to understand my practice in order to be in a position to transform it for the better (Freire, 1970) in ways that enabled students to express their tacit creative knowledge. I therefore resolved to move towards a more dialogical approach and to find ways of providing an inclusional learning culture that fostered creativity. This reflection led to my research question, 'How do I learn to inspire and support my primary education students' creativity in design and technology?'

4.   Grounding my enquiry

Creativity is an essential part of design and technology (Keirl, 2004, p.145) and combines novelty (Cropley, 1999), originality and appropriateness (Sternberg and Lubert, 1995) and involves both intellectual and physical activity. It might be seen as developing something new or making connections between previously unconnected ideas. Creativity in education involves innovation, is grounded in values, and is purposeful, imaginative and original with subjective judgements (DfES, 1999b). De Bono writes extensively about the value and importance of creative thinking for individuals and societies summarised in the following short video extract: http://www.youtube.com/watch?v=UjSjZOjNIJg. Historically creativity was linked to genius and perceived as possessed only by a few exceptional

individuals (Albert and Runco, as cited in Sternberg, 1999, p.18). However Csikszentmihalyi (1996) recognises a particularly engaging motivation that everyone can experience from successful creativity. Gardner (1997) uses the term 'Big C' for the creativity possessed only by a few exceptional individuals whereas Benson (2004, p.138) and Craft (2000, p.3) suggest the term 'little c', also known as 'democratic creativity' (NACCCE, 1999), which, they say, is creativity possessed by everyone and is a more appropriate concept in relation to primary education. My particular interest is in helping students develop their 'little c' creativity in a way they perceive as creative in relation to their practice, how they make meaning and interpret their creativity and how they develop their own creative knowledge (Ihde, 1990, as cited in Dakers, 2006, p.26).

5.   Why was I concerned?

Lack of creative development in teacher training (Davies et al., 2004; Abdallah, 1996) may lead to uninspiring and unfulfilled primary teachers. My reflections from previous courses indicated that students frequently have an expectation of a transmission style of pedagogy in what Freire describes as a 'banking concept of education' (Freire, 1970, p.53). I also recognise the tacit and explicit knowledge (Polanyi, 1967, p.4) the students bring to the course, believing that each one of us creates our own knowledge as we live, and our ideas change with new experiences (Buber, 1923).

It is my experience that students often lack confidence in their capacity for originality of thinking, possibly as an outcome of their cultural and educational experiences, their 'habitus' (Bourdieu, 1990, p.3), tending to rely on my knowledge and secondary sources to provide ready-made solutions to problems. They seemed to lack the creative courage to challenge normative educational practices and to 'Go against the flow' (Abbs, 2005), potentially becoming teachers who fail to provide their pupils with opportunities for creative expression.

I also felt that some of my educational and professional values were being denied in aspects of my practice. A core underpinning value is respect for others and I believe each person will have experiences which will contribute to their educational beliefs and creative expression. I recognise that differences in opinions may be generative and can lead to creative innovation and I value an inclusive educational experience where dialogue is valued. Therefore I work towards an inclusive pedagogy within a culture of equal opportunity towards developing a praxis of collaborative learning. I challenge a curriculum where 'the pragmatics of education, which often take precedence, mean that although desirable, creativity is often marginalised and remains on the periphery rather than at the centre of the curriculum' (Spendlove, 2005, p.9).

6.   How did I show the situation as it was and how it unfolded?

My students, who became my research participants, were all generalist Primary student teachers in their third year of three or four year programmes. They have been on school experiences in both their first and second years. In my university students select two subjects at the end of their first year which they develop as specialist areas. However they

are not required to have any particular qualifications in design and technology to choose this option and few of my research participants did.

The research took place over two academic years from 2006 to 2008 with two cohorts of third year undergraduate primary design and technology students studying aspects of mechanisms and control. The course was in two parts: Part (a) included 10 sessions of teaching, practical work, directed time, personal reflections, and part (b) provided 4 weeks school placement in which, in collaboration with teacher/s, students worked to support primary children learning design and technology.

7.   What data did I gather?

Data was gathered from a range of sources to generate evidence to act as the grounds for my claim to knowledge and to address methodological issues, including triangulation (Cohen et al., 2000, p.111). From the data I gained a comprehensive overview of my practice in relation to the enquiry, showing the situation at the start and end of the taught course, at discrete times during the course and after the school experience.

Ethical considerations were addressed with completion of a self-certified ethics form and agreement from individual students. They were reassured that their identity could remain anonymous in any published work and their participation in the research would not affect their assessment. Colleagues agreed to be critical friends, and a validation panel was convened to which I presented my progress reports and final research paper.

8.   What data did I gather?

The following data was gathered in order to generate evidence to show my emerging practice and my developing learning:

- An attitude scale of questions (see Appendix), informed by Koestler's (1964) theories about creativity, was piloted, edited and distributed at the start of the taught courses, providing me with immediate quantitative data about students' personal and professional perceptions of creativity and the development of their creative knowledge. Analysis of the attitude scales informed modifications to the planned course to meet students' needs at the outset. Repeating the scale at the end of both courses gave comparative data showing changes in attitudes and informing me about how my learning was transforming my practice and about aspects for future improvement.
- An on-going reflective design diary compiled by students in each group with personal reflections showing emerging trends (Hopkins, 1985, p.103) in creative development during the course and on school placement. Comments in their diaries gave me information about incidents where my actions had influenced students' creativity and informed my learning further.
- My reflective journal documenting my changing perceptions and actions and informal discussions with students. This acted as a valuable record for comparing comments with other data to give an overview of my emerging transformational practice.

- Course evaluations and evaluations of after school experience from which I generated evidence about my relational practice with students.

9.   What could I do? What did I do?

I considered a range of strategies to move towards more democratic praxis including the approach suggested by Taylor (2005) who writes about 'trying to encourage children to use me as a tool for their learning' (Taylor 2005, p.181). I decided to aim to improve my role of enabler, allowing students to develop independent and collaborative learning whilst I learnt to develop more emancipatory pedagogies. My actions were particularly inspired by the work of Dewey (1916), Vygotsky, Neill (1998) and Magaluzzi (as cited in Valentine, 2006) in recognising the importance of learning by experience, exchanging ideas and creative development. I modified an existing course to allow for more collaboration and creative development in a number of ways, as follows:

- I reduced time spent disseminating information, leaving more time for discussion, and dialogical critique. Most sessions began with time for discussions about readings, on-going designs or personal reflections.
- I introduced a student 'reflective design diary' as a record of their subject knowledge and personal development. Students were encouraged to include self-reflections to present their work in a personal way reflecting their developing creativity. Some used techniques developed in sessions such as sliders and 'lift the flap' to display designs, ideas and reflections.
- I gave selected readings at intervals. The readings supported discussions and reflections about theories surrounding creativity in design and technology.
- I introduced 'creativity starters' These consisted of quick, practical activities intended to generate divergent and designerly thinking. For example I provided a small bag containing a few random items such as paper clips, a paper plate and a length of string. Pairs of students were asked to use the items to design and make a product for a specified user with a particular purpose. This type of activity requires creative thinking to make an original product which has a purpose.
- I encouraged a culture of informal feedback about my practice. I asked students' opinions and frequently modified plans in a move towards a more collaborative learning environment in a 'co-operative learning base' (Johnson et al., 1984).

I used my key values of respect, inclusion, equality of opportunity, experiential learning and professional commitment to guide my practice in my planning and as my living standards for judging the quality of my research (McNiff and Whitehead, 2006, p.150). I presented my on-going reflections on my research to my critical friends for feedback. I received helpful and encouraging comments which informed my research and my practice such as emphasising to students that creativity in design and technology means having consideration for both originality and purpose and allowing time for development of procedural knowledge in sessions.

Key successful activities such as discussions about readings and using reflective design diaries (Aston and Jackson, 2009) were retained and my pedagogy developed to improve towards living my values in my practice.

10. What was the outcome?

The groups were small and all were women. Group A comprised 9 students identified as A to J (no 'I') and group B comprised 6 students identified as K to P (no 'O'). A friendly, professional learning community developed in both cohorts. A number of students (noted in my journal) commented about the enjoyable, relaxed but active learning environment (see data below).

11. Attitude Scales

The attitude scales I distributed to inform me about students' perceptions of their personal and professional creative development began as a data collection method but became a useful discussion tool at the start and end of the courses and a strategy I will adapt and retain in my future practice. Results (see student comments below) showed that students valued the learning environment, and for some it changed their perceptions of their creative capacity in a positive way.
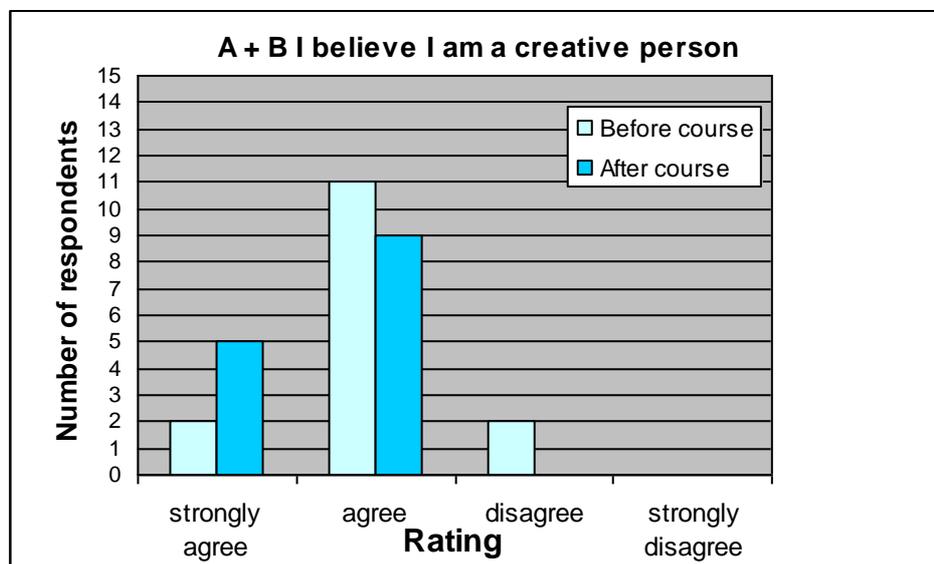

Figure1.   Bar graph to show student perceptions of their creativity

12. Time for discussion

Both groups were challenged when first asked to express their ideas verbally. However the discussions that followed frequently gained impetus as each student seemed increasingly inspired to speak in response to comments from others, respectfully challenged other people's perceptions and so refined their own ideas in a *dialogical theory of action*

(Freire, 1970, p.167): 'I feel it has been useful to share ideas, as this brings the opportunity to discuss and develop the idea into a more concrete design' (Student M., personal communication).

I frequently questioned my decision to prioritise certain activities over others for example teaching subject knowledge or allowing time for more practical work and will continue to share my concerns with my students and critical friends in order to come to a more acceptable practice.

During the course I observed a distinct change in practice, particularly in group A. They moved from being a group of diverse people engaged in similar activities to a cohesive community engaged in relational learning in a way that Buber describes as an 'I-thou' relationship (Buber, 1923, p.85). This outcome was significant to my learning, as relationships within the two groups were supportive in very different ways and I was aware of responding in different ways to each group.

Although many students stated on the attitude scale at the outset that they preferred to work alone, the data shows a general trend by the end of the course towards valuing group critique and support, as demonstrated in Figure 2 and students' comments, as shown here:
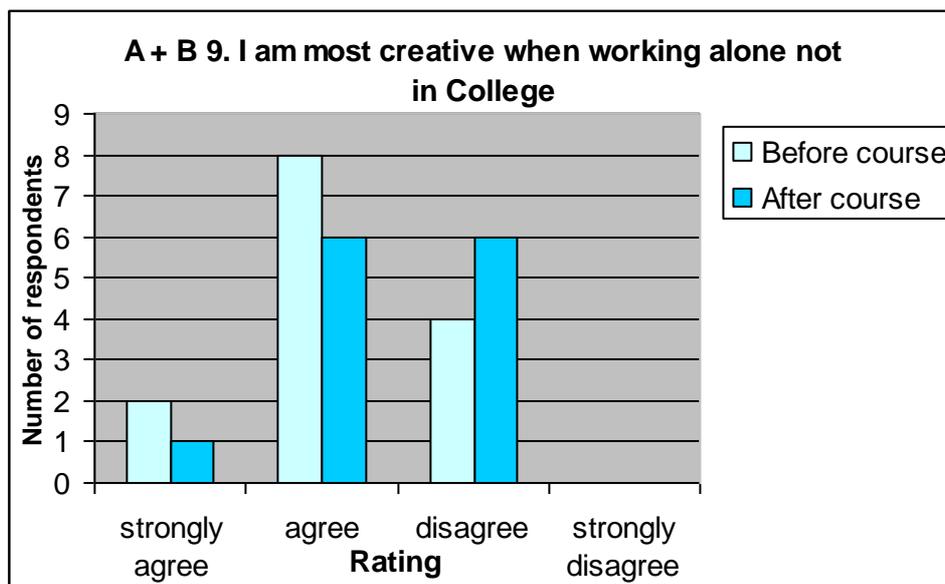

Figure 2.   Bar graph to show the results from students' attitude towards preferred working place

The resource was made through collaborative work. This allowed each member to support one another and alter initial ideas. It gave us opportunities to be creative as there was one topic seen through different perspectives. (Student P., personal communication, March, 2008)

I also find it useful to hear other people's ideas as this sometimes offers inspiration to think of my own ideas. (Student M., personal communication, December, 2007)

Students also commented about their increased awareness of their own capacity for creativity such as Student H who commented: 'The course has changed my perception (of my creativity) completely. Before the course I did not think I was creative at all. Now I realise that in fact, I am quite creative' (Student H., personal communication, March 2007).

Group B students were confident in their creative ability at the start and yet over the course developed their capacity for critical reflection, and discussions revealed that some had reviewed their ideas about creativity and supporting children in design and technology. Student P reflected, 'I am now a more creative thinker... I aimed to be creative and have also done so on school experience during display work and activities' (personal communication, March, 2008).

However one student pointed out an observation I shared that sometimes 'my creativity is higher than my ability' (Student L., personal communication, March, 2008), raising a significant point about developing self knowledge and implications for personal target development.

Adjusting my practice in accordance with my commitment to respect the contributions of my students by allowing more time for discussion has resulted in many students reflecting on their creative capacity in an atmosphere for creative learning. The following comments show this situation in action:

> I feel this course has helped me develop my creativity. I like the way that Dot prompts us to share our ideas and then we evaluate them as a class. This really helps me and I find it less formal. (Student N., personal communication, March, 2008)

> The course has helped develop my creativity hugely – the freedom of the course has been a strength! (Student H., personal communication, March, 2007)

Results also showed that the majority of students valued the inclusive learning environment and for some it increased their confidence: 'My confidence has greatly increased (through working with others)' (Student L., personal communication, March, 2008).

13. Reflective Design Diaries

Students approached compiling a reflective design diary in a range of ways. For some it allowed an expression of their tacit creative ability and they were awakened to a skill they had not recognised in their previous work (see comment by student H). For others it was an opportunity to have their artistic skill celebrated as we shared the diary entries during the course. Student N reported that her experience of teaching an autistic boy who responded in a transformational way when encouraged by creative activities supported the importance of creativity in the curriculum.

Both groups found that keeping reflective design diaries gave them opportunities to reflect about their learning (Aston and Jackson, 2009) and they valued their reflections as shown by the following comments:

> The reflective diary enabled me to reflect and evaluate ideas I have. It has allowed me to look at ways in which I was creative and worked well and why. It helped me reflect and

evaluate my own learning and find ways to improve. (Student B., personal communication, March, 2007)

Student H (personal communication, March, 2007) wrote 'I found that I was able to see my own creativity developing- which was very useful', and Student N (personal communication, March, 2008) believed that 'The reflective diary allowed me to flick back to the beginning and see how much I have progressed.'

Reflecting on these comments I recognise that giving students this opportunity to reflect and articulate their ideas in words and designs could be emancipatory and empower students to recognise and use their new knowledge about their capacity for creativity. I will therefore continue to give students recognition for their work by including reflective design diaries in the assessment for this module.

14. Creativity starters

Creative starters comprised short activities to promote divergent thinking; for example:

- thinking of alternative uses for familiar objects such as CD roms, clothes pegs, paper clips and plastic bags
- suggesting original designs linking usually unconnected ideas such as fruit and shoes
- following watching a video of children in Kenya making wire toys (galimoto), students used thin wire and a stone to form the wire into a shape which represented an aspect of their personality
- small groups of students were provided with bags containing a few random objects and asked to design and make an original product for a particular user (such as a small child).

These activities were developed as a new pedagogical strategy following my reflections about whether I had offered sufficient opportunities for developing creative thinking skills, and proved to be both popular and revealing about students' own perceived creativity as shown by Student M (personal communication, March, 2008) who commented in her reflective design diary, 'I found this a very good way to stimulate ideas. It forced you to make connections that you may have not originally thought about.' Another student wrote:

> One particular activity that we completed within a session was each person was given a random everyday object. I was given a stirrer, and the other peers were given a CD or a paper clip. Our task was to come up with as many uses as we could, for this particular object. I was surprised at the amount of things I thought of, and this task made me realise that I can be quite creative and I should use this creativity. (Student M., personal communication, March, 2008)

These activities engaged the students in active, creative participation for much longer than expected so I adjusted the remainder of sessions accordingly. I felt this action was more in line with my value of respect for my students, and the overall learning outcome of the

session was not compromised as the students were motivated by their creative success (Csikszentmihalyi, 1996). I also recognised that 'With guidance, students learn that their creativity is legitimate and that it can lead to change' (Keirl, 2007, p.61). Figure 3 shows how a student used knowledge and skills about wheel and axle mechanisms developed in session to make an original product. Creativity is shown by linking two previously unconnected ideas of vehicles and monsters.
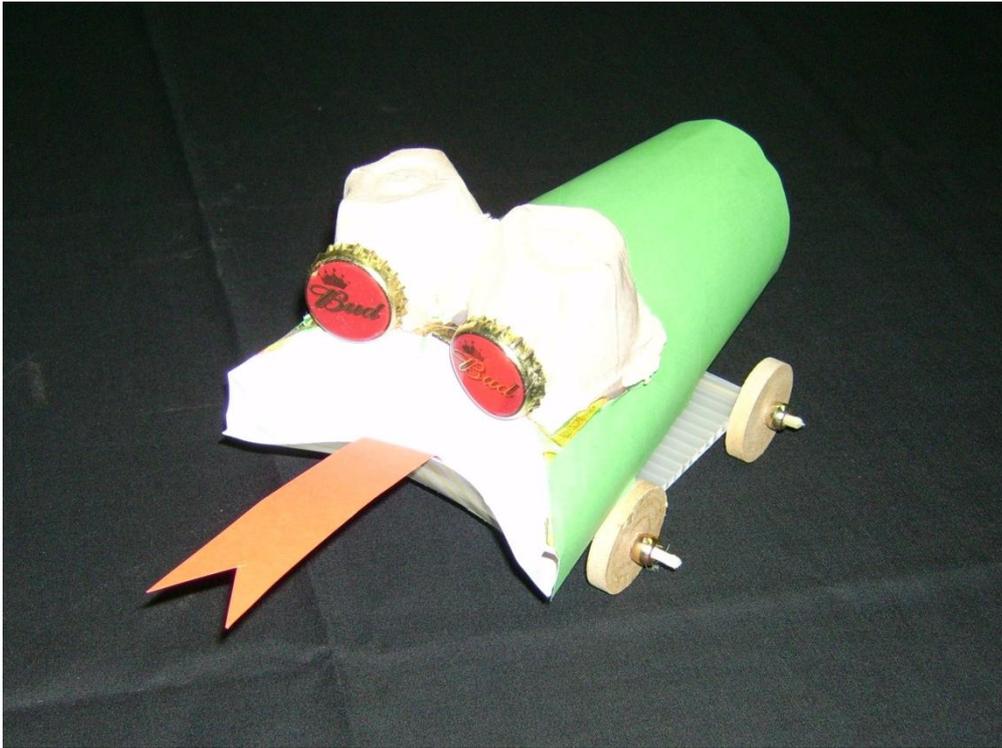

Figure 3.   Linking previously unconnected ideas; a wheel and axle vehicle linked to a monster theme

15. Collaborative learning environment with dialogical critique

As students began to show confidence and break away from 'craft' towards creative innovation I identified which changes in my pedagogy were best for supporting their learning. These included developing a 'pedagogy of listening' (Rinaldi, 2005) as students expressed their ideas and concerns whilst designing and making. The dynamics of both groups had significantly changed by the end of the taught courses. Group B in particular showed a marked change after the school placement, seemingly inspired by taking their newly found ideas and confidence into their practice (research diary, November 23, 2007). By nurturing the students' latent creativity in a supportive and collaborative learning environment I may have provided an atmosphere where they felt secure in making their tacit knowledge explicit, and the confidence to transfer it into their practice.
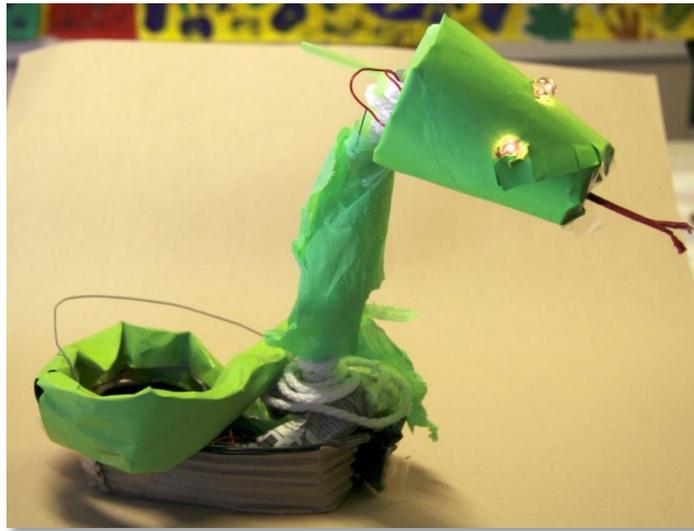
Figure 4.   'Cecil' the snake lamp

The student who made 'Cecil' seen in the photograph above initially planned to make a model lighthouse but after discussion about the importance of 'real user real purpose' in designerly thinking she designed a lamp specifically for a boy she knew who likes reptiles. This design decision shows the student becoming confident in her creative ideas and competence to break away from a known design and create a completely original one.

Other examples of how students created original products designed for a 'real user' and 'real purpose' (Benson, 2005) are illustrated below (note that in Primary education a fictional character may be considered 'real' for the purposes of designing products).
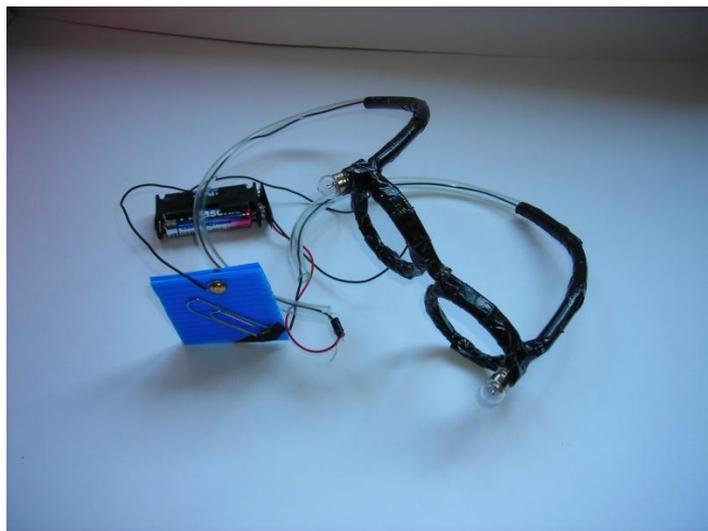

Figure 5.   Glasses for Harry Potter so he can see in the dark

Figure 6.   A night light for the Lost Boys in Peter Pan

Some students were reluctant to abandon the familiarity of the normative roles of teacher and student but a range of comments from both groups indicate a general transformation towards independent learning and an increase in student confidence. One student responded:

> At first I did not feel very creative. The course has helped me develop confidence to try new ideas and as a result developed my creativity. It has helped me reflect on things that I have made and why they were creative. (Student B., personal communication, March, 2007)

Affirming data about how my values have been expressed in my practice include comments from end of taught course evaluations such as 'Really enjoyed the course and felt that Dot really encouraged our development' (Student H., personal communication, March, 2007), showing the realisation of my values of respect, inclusion, motivation and a commitment to recognising my learning and that of my students.

16. The school placement

I was encouraged by the professional and confident approach the students adopted when negotiating with schools. Student B also made creativity a focus of her school experience, sharing ideas with the class teacher, suggesting my practice may have had an influence beyond my student groups and into the wider educational community.

17. How did I ensure that any conclusions I came to were reasonably fair and accurate?

I presented my research to colleagues and critical friends who acted as my validation panel to scrutinise my evidence and give critical feedback about my claims to knowledge judged against the following criteria:

- Have I articulated my key values of respect for individuals, their opinions, needs and ideas, equality of opportunity and commitment towards supporting well informed, reflective, creative primary design and technology practitioners, and does the evidence provided reflect this?
- Does my research clearly demonstrate a belief in the importance of a collaborative and supportive learning community to inspire independent creative development?
- Does the evidence show an emerging picture of an improvement in student perception of their creativity in design and technology and my ability to provide an appropriate creative climate?
- Is there sufficient evidence to show how I have generated new knowledge about my practice and new theory in the form of dynamic relational and transformational living theory?

Feedback from my presentation was positive and they supported my claim to knowledge based on the evidence presented offering useful critique.

18. What is the potential significance for my learning, for the learning of others and for the wider community?

Following my on-going reflections, student comments and discussions with my critical friends who were also engaged in action research enquiries, I made changes and began to move my pedagogical practice away from a didactic approach and more in line with my student-centred beliefs.

I was uncomfortable at first, suggesting to students that they would lead their own learning, as it was clear that many preferred the normative roles of pupil and teacher, and I questioned whether I was practising within my values of freedom and respect. After reflecting on further discussions with my critical friends, I decided that by encouraging dialogical critique during taught sessions I was able to make gradual modifications to my practice while meeting student needs; and students began to comment that they were slowly gaining confidence in their own ability. The whole discourse of how the group interacted was significant and informed my developing emancipatory pedagogy. I realised that with reflexive practice and by challenging my own assumptions I could, in fact, move towards living my values in my practice.

I have learned that careful consideration needs to be made for providing an appropriate creative culture where students feel secure in having their ideas critiqued

respectfully and that the pedagogies and dynamics surrounding this culture will be particular to each group of students. I recognise the following:

- The need to see my practice as a whole and not concentrate on improving one identified aspect but recognise the impact of change on my overall pedagogy.
- The difficulties and importance of establishing a culture of discourse and working towards an 'ideal speech situation' (Habermas as cited in Sickle, n.d.) where each person feels equally able to express opinions in a respectful learning culture.
- By sharing my concerns with my students in dialogical praxis I live my value of respect in my practice and by engaging in relational learning my influence may transfer beyond the group and become adopted in my students' practice.
- The importance of listening. By introducing a culture of sharing ideas I have learnt to listen more closely and honestly to students' suggestions and encourage students to learn from one another. In this way I adopted a more inclusive pedagogy in line with my value of social justice and as a result there was real co-creation of knowledge.
- The importance of providing for the acquisition and participation (Sfard, 1998) of skills and knowledge generation to support creative expression.
- Time for discussion. Ideas, like designs, do not always come to mind instantly and time is needed to develop ideas in collaborative creative decision-making.
- The importance of the school placement for students to take new learning into their practice, share it with teachers and children and reflect further. In this way my transformational learning may disseminate into the wider community.

19. How will I modify my concerns, ideas and practice in the light of my evaluation?

Although this educational action enquiry was with small groups of students, the quantity and quality of learning has been immense. My research colleagues provided an important supportive and critical group with which to share and develop my ideas and I will take my new learning into my future practice with all my cohorts of students and continue with new cycles of reflection-on-action.

Since embarking on this research I am able to articulate that my pedagogy has transformed towards collaborative praxis across all my teaching courses, from challenging an expectation of craft and moving towards innovative designerly practice. I have made changes informed by my dynamic reflections towards my own living theory of creative practice. My learning has taken place at a range of levels and in various places from individual conversations to pedagogical reflections. I recognise new ways in which I can support the development of necessary skills and knowledge in design and technology whilst also providing a critical 'creative ecosystem' (Harrington, 1990) where co-creation of knowledge can take place.

I continue to work towards empowering students to challenge normative pedagogical practices, recognise their ability to create their own knowledge and to move confidently towards living their values in their practice. My new living theory of practice was

disseminated to the wider academy in a symposium at the Collaborative Action Research Network Conference November 2008. I continue to contribute to a new living epistemology for a scholarship of educational knowledge.

My learning may gradually flow into schools through the pedagogies of my students as they take their new learning into schools. I use a river delta as a visual metaphor for my transformational learning as my enquiries develop and branch out in various directions while flowing in the general direction of new understanding and knowledge creation.

References

Abbs, P. (2005). *Against the Flow: the Arts, Postmodern Culture and Education.* London, New York: RoutledgeFalmer.

Abdallah, A. (1996). Fostering creativity in student teachers, *Community Review, 14*, 52-58.

Albert, R. S. & Runco, M. (1999). *History of Research on Creativity.* In R. Sternberg (ed.) *Handbook of Creativity (*pp.16–31). Cambridge: Cambridge University Press.

Archer, B. (1992). The Nature of Research in Design and Design Education. In B. Archer, K. Bayners & P. Roberts, *The Nature of Research in Design and Design Education: Design Curriculum Matters* (pp.7-14). Loughborough: Loughborough University of Technology. Retrieved August 25, 2009, from http://www.lboro.ac.uk/departments/cd/research/idater/downloads_orange/Nature%20of%20Research.PDF

Aston, S. and Jackson, D. (2009). Using Design Diaries to Develop Critical Thinking. *International Design and Technology Conference Journal, 7*, 9–13.

Baynes, K. (1992). Research into Primary Design and Technology. In B. Archer, K. Bayners & P. Roberts, *The Nature of Research in Design and Design Education: Design Curriculum Matters* (pp.15-21). Loughborough: Loughborough University of Technology. Retrieved August 25, 2009, from http://www.lboro.ac.uk/departments/cd/research/idater/downloads_orange/Nature%20of%20Research.PDF

Benson, C. (2004). Caught or Taught?. *The Journal of Design and Technology Education, 9*(3) 138-144.

Benson, C. (2005). Developing Designerly Thinking in the Foundation Stage. *International Design and Technology Conference Journal, 5*, 15-18

Bourdieu, P. (1990). *In Other Words: Essays Towards a Reflexive Society.* Cambridge: Polity Press, Blackwell Publishers.

Bronowski, J. (1973). *The Ascent of Man*. London: British Broadcasting Association.

Buber, M. (1923). *I and Thou*. New York: Scribner.

Butterworth, L. (2006, July 11). The Role of Craft in Reshaping Design Education. In National Society for Education in Art and Design (NSEAD). *Design Education: Now you see it, now you don't*. Report of a Seminar organised by the National Society for Education in Art and Design (NSEAD) and the Design & Technology Association (DATA) with the support of the Department for Education and Skills (DfES) at the Royal College of Art. Retrieved April 13, 2008, from http://www.nsead.org/downloads/Design_Ed_Report_2006.doc

Cohen, L., Manion, L. and Morrison, K. (2000). *Research Methods in Education (5th Edition)*. London and New York: RoutledgeFalmer.

Craft, A. (2000).*Teaching Creativity: Philosophy and Practice*: London and New York, Routledge.

Cropley, A. J. (1999). Creativity and cognition: Producing effective novelty. *Roeper Review, 21*(4)*,* 253-261.

Csikszentmihalyi, M. (1996). *Creativity: Flow and the Psychology of Discovery and Invention.* Glasgow: HarperCollins Publishers.

Dakers, J. (2006). Is Design and Technology Education Really Real?. *The Design & Technology Association International Research Conference Journal 2006*. Retrieved August 25, 2009, from http://hdl.handle.net/2134/2850

Davies, D., Howe, A. and McMahon, K. (2004). Trainee primary teachers and creativity in the curriculum. *Design and Technology Association International Research Conference Journal* 2004. Retrieved August 25, 2009 from http://hdl.handle.net/2134/2865

Davies, D. and Howe, A. (2005). Creativity in Primary Design and Technology. In A. Wilson (Ed.), *Creativity in Primary Education* (pp.172-184). Exeter: Learning Matters.

Department for Education and Employment. (1999a). *All our futures: Creativity, cultures and education*.   Retrieved   August   25,   2009,   from http://www.cypni.org.uk/downloads/alloutfutures.pdf

Department for Education and Skills. (1999b). *What is Creativity?* Retrieved July 22, 2008 from   http://curriculum.qca.org.uk/key-stages-1-and-2/learning-across-the-curriculum/creativity/whatiscreativity/index.aspx?return=/search/index.aspx%3FfldSiteSearch%3Dcreativity%26btnGoSearch.x%3D23%26btnGoSearch.y%3D12

Department for Education and Skills. (2003). *Excellence and Enjoyment Strategy*. Retrieved April   19,   2008,   from http://www.standards.dfes.gov.uk/primary/publications/literacy/63553/

Department for Education and Skills and Qualifications and Curriculum Authority. (2004). *Design and Technology, National Curriculum for England.* Retrieved August 6, 2009, from http://curriculum.qca.org.uk/uploadsesign%20and%20technology%201999%20programme%20of%20study_tcm8-12063.pdf

Dewey, J. (1916) *Democracy and Education.* London: The Macmillan Company.

Finlayson, J. G (2005). *Habermas: A Very Short Introduction*. Oxford: Oxford University Press.

Frayling, C. (2006). *Design Education: Now you see it, now you don't.* Retrieved April 13, 2008, from http://www.nsead.org/downloads/Design_Ed_Report_2006.doc

Freire, P. (1970). *Pedagogy of the Oppressed*. New York: Continuum.

Fromm, E. (1956). *The Art of Loving*. New York: Harper Row.

Gardner, H. (1997). *Extraordinary Minds*. London: Harper-Collins.

Ghaye, A. and Ghaye, K. (1998). *Teaching and Learning through Critical Reflective Practice*. London: David Fulton.

Good, K. and Jarvinen, E-M. (2007). The Starting Point Approach to Design and Technology in Action- An examination. *International Design and Technology Conference Journal, 6,* 50-51.

Hargreaves, D. (2000, November 22). *Towards Education for Innovation.* Lecture given at the Institute for Education, London.

Harrington, D. M. (1990). The Ecology of Human Creativity: A psychological perspective. In Runco, M.and Albert, R. (eds.) *Theories of Creativity* (pp. 143-169). London: Sage Publications.

Hopkins, D. (1985). *A Teachers Guide to Classroom Research.* Milton Keynes, Open University Press.

Johnson, D., Johnson, R. and Smith, K. A. (1984). *Co-operative Learning.* Retrieved April 10, 2008, from http://www.ce.umn.edu/~smith/docs/CLHks.pdf

Keirl, S. (2004). Creativity, Innovation and Life in the Lily Pond: nurturing the design and technology family while keeping the alligators fed. *The Journal of Design and Technology Education, 9*(3,) 145-160.

Keirl, S. (2007). Designing Better Worlds? Values for vision through Primary Design and Technology Education. *International Primary Design and Technology Conference Journal, 6,* 61-65.

Kimbell, R. and Perry, D. (2001). *Design and technology in a knowledge economy*. London: Engineering Council.

Koestler, A. (1964). *The Act of Creation*. London: Macmillan.

Keyte-Hartland, D. (2006). In The Jungle with The Children of Adderly. *Refocus journal*. Retrieved August 25, 2009, from http://www.sightlines-initiative.com/fileaddmin/users/files/ReFocus/Library/Articles/PDFs/inthejunglewith.pdf.

McNiff, J. and Whitehead, J. (2006). *All you Need to Know about Action Research.* London: Sage.

National Advisory Committee on Creativity, Culture and Education (NACCCE). (1999). *All Our Futures: Creativity, Culture and Education*. London: DfES.

Neill, A. S. (1998). *Summerhill School: A New View of Childhood*. New York: St Martin's Griffin.

Office for Standards in Education (Ofsted). (1995). *Design and Technology – a review of inspection findings 1993–4.* London: HMSO.

Pitt, J. (2006). *Just What is Creativity?.* Retrieved April 9, 2008, from http://www.secondarydandt.org/dandtworld/report_0000000711.asp

Qualifications and Curriculum Authority (2004). *The National Curriculum: Creativity and Critical Thinking.* Retrieved August 25, 2009, from http://curriculum.qcda.gov.uk/key-stages-3-and-4/cross-curriculum-dimensions/creativitycriticalthinking/index.aspx

Polanyi, M. (1967). *The Tacit Dimension*. New York, Anchor.

Rinaldi, C. (2005). *In Dialogue with Reggio Emilia*. London: Routledge.

Schön, D. A. (1995). The New Scholarship Requires a New Epistemology. *Change. 27*(6), 26-34.

Sfard, A. (1998). On Two Metaphors for learning and the Dangers of Choosing Just One. *Educational Researcher*, *27*(2), 4–13.

Sickle, S. (n.d.). J. An introduction to Habermas. Retrieved March 21, 2008, from http://www.engl.niu.edu/wac/hbrms.html

Spendlove, D (2005). Creativity in Education: A review. *The Journal of Design and Technology Education, 10*(2), 9-18*.*

Sternberg, R. J. and Lubart, T. I. (1995). What is the common thread of creativity? Its dialectical relation to intelligence and wisdom. *American Psychologis, 56*, 360-362.

Taylor, R. (2005). The 'Designerly Thinking Project': The beginning of a Pedagogical Journey. In C. Benson, S. Lawson, & W, Till (eds.) *Proceedings of Fifth International Primary Design and Technology Conference* (180+)*.* Birmingham: CRIPT.

Usher, R, D (2002). A Critique of the neglected epistemological assumptions of educational research. In R. Usher and D. Scott (eds.), *Understanding Educational Research* (9-32). London: Routledge.

Valentine, M. (2006). *The Reggio Emilia approach to Early Years Education*. Glasgow: Scottish Education.

Welch, M. (2007). Learning to Design: Investigating the "Inner Activity" of the Pupil. *Design and Technology Association: An International Journal, 12*(3), 17-32.

Wenger, E. (1998). *Communities of Practice: Learning, meaning, and identity.* Cambridge: Cambridge University Press.

Whitehead, J. (1989). Creating a Living Theory from Questions of the Kind 'How Do I Improve My Practice?'. *Cambridge Journal of Education*, *19*(1), 41–52.

Whitehead, J. and McNiff, J. (2006). *Action Research: Living Theory.* London: Sage.

Appendix

Mechanisms and Control. Design and Technology
Attitude Scale

On this scale you will record your attitude towards your creativity in your personal and professional life at the start of the mechanisms course. You will complete another scale at the end of the course and we will discuss the two scales and your developing attitudes.

Name:_____

1. I believe I am a creative person	Strongly agree	agree	disagree	Strongly disagree
Comment				
2. I usually think creatively to find solutions to problems	Strongly agree	agree	disagree	Strongly disagree
Comment				
3. Developing my own creativity is important to me.	Strongly agree	agree	disagree	Strongly disagree
Comment				
4. I am generally confident in my ability to imagine new ideas for designing products	Strongly agree	agree	disagree	Strongly disagree
Comment				
5. Evaluating existing products before I design my own is useful	Strongly agree	agree	disagree	Strongly disagree
Comment				
6. I like following instructions when making things	Strongly agree	agree	disagree	Strongly disagree
Comment				
7. I am not confident in my D& T skills for designing products	Strongly agree	agree	disagree	Strongly disagree
Comment				

8. I need a lot of time to think and research about designs before making them	Strongly agree	agree	disagree	Strongly disagree
Comment				
9. I am most creative when working alone not in College	Strongly agree	agree	disagree	Strongly disagree
Comment				
10. Hearing about other people's ideas inspires me to think up my own original ideas	Strongly agree	agree	disagree	Strongly disagree
Comment				
11. Using scrap materials to make prototypes and try out ideas helps my creativity	Strongly agree	agree	disagree	Strongly disagree
Comment				
12. I prefer to design a product on paper before I make it	Strongly agree	agree	disagree	Strongly disagree
Comment				
13. Being creative in my teaching is important to me	Strongly agree	agree	disagree	Strongly disagree
Comment				
14. I do not think I have considered creativity much in my planning and teaching	Strongly agree	agree	disagree	Strongly disagree
Comment				

Additional comments: