To what Extent does the Pedagogy adopted by Trainee Teachers affect Children’s Creativity in Primary Design and Technology Activities?

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End of module evaluations from Primary Education trainee teachers in an English university indicate that many trainees lack confidence in supervising practical activities within the classroom. This initial study is part of a larger piece of action research exploring the effects of trainee teachers’ interventions and teaching strategies on children’s creativity.

This paper presents some initial findings from a small scale study undertaken in June 2011 with students from a first year of a Primary Education undergraduate course based in an English university. The findings from this initial study originated from a design challenge day, when the trainees were asked to work with 60 eleven years old pupils and act as mentors to small groups of pupils. The pupils were asked to adopt a design process inspired by design engineers at Dyson and designed and made design prototypes for a new product using air. The data collection methods used were questionnaires with trainees, photographs of pupil outcomes, observations during the day and trainees’ reflective diaries.

The evidence suggests that the trainees encountered a number of creativity inhibitors during the day (Fasciato and Rogers 2005) and these were centred on supporting dynamics of pupil groups, risk taking and collaborative interaction.

Context
This paper reports on an initial study exploring the pedagogical influences upon children’s creativity in primary design and technology with a specific emphasis on the influences of trainee teachers’ actions. As a lecturer working with Primary Education trainee teachers in an English University, I have often observed trainees relying on formulaic procedures and resources when teaching or planning to teach design and technology.

The Bachelor of Arts (BA) Honours Primary Education with Qualified Teacher status (QTS) is a three year undergraduate route which has a number of elective modules throughout the three years. End of module evaluations indicate that many trainees lack confidence in supervising practical activities within the classroom and from discussions with trainees it is clear that some do not link theory and university based learning to practice within schools. So the elective module for design and technology (D&T) in year 1 of the course was designed to include a school based experience for the trainees.
The trainees were asked to work with a group of sixty eleven year old pupils in a local primary school during a design challenge day. The pupils were asked to work in teams to design and make a product. The trainees were asked to work as mentors to develop their understanding of pupil led activities and gain insight into pupils’ creativity during pupil initiated designing and making. When marking assignments, I find that trainees, when asked to teach D&T often make project booklets for pupils to work in and I hoped to demonstrate that valid D&T experiences do not have to be based on using formulaic booklets. From discussions with primary education trainees, it is evident that some do struggle with supporting creativity, citing classroom management issues being one of the most common issues. The aim of the study was to explore two research questions.

1. What effect did the trainees’ interventions have on pupils’ creativity?
2. What difficulties did the trainees encounter when supporting pupil initiated activities?

The design development day took place during June 2011 at the end of a week-long module with nine first year undergraduate trainees who had chosen to study the elective D&T module. During the first year of their degree they had all also experienced an initial module in D&T with four sessions of two and a half hours. The trainees were asked to work with an unknown group of sixty eleven year old pupils of mixed gender and ability. They were supported by two university staff and three teachers from the primary school. The environment in which they worked was a school hall, three classrooms and a corridor with a range of resources and equipment. The pupils were asked to investigate a range of vacuum cleaners and then design a new product that utilised air and to work in a way that mirrored the design process used by design engineers from the James Dyson Foundation.

**Literature Review**

The document All Our Futures (1999:6) offers a definition of creativity as ‘a balance between teaching knowledge and skills, and encouraging innovation’ and ‘imaginative activity fashioned so as to produce outcomes that are both original and of value’ (NACCCE, 1999:29). However Benson and Lunt’s (2011) study outlines four essential factors for creativity: ownership and control; relevance; space and time and interaction with others.

Benson and Lunt (2011) outline the need for children to take ownership in order for successful outcomes and outline the importance of peer to peer and peer to adult interactions and their role in supporting creativity. They also cite Jeffrey and Woods (2003) who suggest that a ‘hands on’ style of learning is vital in making learning significant and which in turn provides ownership; both vital ingredients for creativity. These findings are backed up other researchers Hamilton (2007:27) who argues that ‘collaborative interaction and imaginative engagement’ together with ‘greater independence and risk taking’ empower both pupils and teachers. McLellan and Nicholl (2008) found that a lack of freedom or pupils’ perception of a lack of freedom also undermines creativity. Kruger (1993) also suggests that pupils working collaboratively make more progress. Twyford and Burden (1997:1) contend that understanding of the learning process is developed through ‘considering the dynamic interaction between learners, teachers, tasks and contexts.’ This view is supported by Trebell (2007) who drawing on Vygotsky’s work considers that designing relies on social interaction.

Research suggests that other factors may be influencing creativity. The use of formulaic pupil booklets frequently used by trainee primary teachers do not support creativity in pupils (Haffenden 2004; Nicholl and McLellan 2007; Trebell 2007). Musta’amal et al (2009) suggest that modelling is also a key process within creativity and that it can support a number of creative behaviours which include risk taking, decision making, change, exploration of possibilities, openness to new ideas, understanding of a problem and reflection. Fasciato and Rogers (2005:29) state that ‘creativity inhibitors appear to be as much of a problem for teachers teaching, as for children learning’ and these ‘inhibitors’ prevent creative teaching and learning. Their study found that a number of factors restricted creativity and these included restriction of choice and time, over controlled tasks and
a lack of experimental and risk taking. This is backed up by Nicholl and McLellan whose research (2007) argues that teachers and teaching strategies are crucial in the support of creativity and unsupported pupils will find it hard to be creative. However if classroom practice and teachers are influential in supporting creativity, as researchers (Fasciato and Rogers 2005; Nicholl and McLellan 2007) suggest, it could be argued that trainee teachers encounter real problems in supporting creativity within their classrooms.

Nicholls and McLellan (2007) offer the view that pupils need to be inspired at the start of design and making activities to avoid the pitfalls of becoming fixate. Karen (1979) cited in Davies (1996:1) discusses the need to support ‘original and expansive thinking’ and states that pupils can be asked to be too practical too soon, claiming that it is too difficult for pupils to be original and thinking about practical issues of construction. Davies (1996) puts forward the view that pupils need prior experience of materials and techniques for creativity through modelling to develop creativity. Therefore by using a design challenge day where the pupils would design and make design prototypes as modelled by Dyson’s engineers, it was hoped that this would be more supportive of pupils’ freedoms (Benson and Lunt, 2011; Fasciato and Rogers, 2005; Hamilton, 2007; Trebell 2007). Mettas and Constantinou (2006) also state that a technology fair is a useful strategy for Initial Teacher Education establishments to use with trainees to promote pedagogy and can contribute to the development of positive values and attitudes.

Methodology
The data was collected from trainees’ diaries, photographs of pupils’ outcomes and observations during the day. The questionnaires were completed anonymously and were used to collect qualitative data from the trainees using open and closed questions and focused upon their perceptions of the creativity inhibitors and how they perceived these impacted on pupils’ outcomes. It would have been useful to further triangulate these results with interviews and to have collected data from the pupils but this was not possible in this study. Ethical issues were major considerations due to the involvement of a teacher as a researcher as it could be argued that the trainees focused upon in this study could feel under pressure to take part (Bell, 1987). The trainees undertaking the elective module were invited to part and it was made clear that they were under no pressure to take part in the study and that all data would be confidential and that they could withdraw at any point during the study. One trainee chose not to take part. All pupil identities were concealed.

Findings
The trainees’ written evaluations of the day reveal that they perceived difficulties with establishing relationships with the pupils. This slow development of the pupil teacher relationship acted as a creativity inhibitor (Fasciato and Rogers 2005) and links to Twyford and Burden’s research about the dynamic interaction needed (1997). In trying to establish the social interaction the trainees adopted a number of strategies to initiate the product analysis as the first activity of the day (Trebell 2007; Benson and Lunt 2011) (Figure1). Sixty four per cent of the trainees perceived that the pupils were shy or nervous at the start of the design challenge day, although this was contradicted by a member of staff who told one trainee that the pupils were being polite not shy.
Strategies used by trainees to initiate social interaction.

<table>
<thead>
<tr>
<th>Strategies used by trainees who struggled to initiate social interaction.</th>
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<tbody>
<tr>
<td>Minimal initial prompts but allowed pupils to take charge.</td>
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<td>Asked pupils to work as one group and did not let pupils split into sub groups.</td>
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<tr>
<td>Had positive ‘can do’ attitude to pupils’ abilities, i.e. problem solving and being logical.</td>
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<tr>
<td>Immediately proactive and asked pupils to get involved with investigating the vacuum cleaners promptly.</td>
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<tr>
<td>Allowed pupil conversations to develop and did not intervene or dominate.</td>
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<tr>
<td>Only intervened when the pupils were stuck.</td>
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Problems with managing the social interaction continued into the second stage of the day when pupils were asked to identify a user and purpose for a new product using air. When asked how successful the pupils were in this, the questionnaires identify a definite split between the trainees’ answers. Forty six percent of trainees who thought that the product analysis was more teacher led rather than child led; their teams of pupils only identified 3 to 4 potential users and purposes. Whereas forty six percent of trainees who thought that the first session were child led, their teams could identify at least 7 to 10 and 10 plus potential users and purposes. The creativity inhibitor here appeared to be a lack of ownership and control for pupils (Benson and Lunt 2011; Hamilton 2007; Fasciato and Rogers 2005) and restriction of social interaction between peers (Benson and Lunt 2011; Hamilton 2007; Kruger 1993; Trebell 2007). Eighteen percent of these trainees also identified that they led brainstorming sessions and provided design ideas. The rest of the trainees identified that they only provided procedural support in making techniques and modelling ways forward when the pupils got stuck (Musta’amal et al 2009).

Trainees’ diaries and observations during the day reveal that again there were clear differences in the strategies used by trainees who perceived difficulties in managing pupils’ decision making and those trainees who perceived they struggled (Figure 2).

<table>
<thead>
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<th>Strategies adopted by trainees who were successful in managing decision making.</th>
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<td>Strategies adopted by trainees who were not successful in managing decision making.</td>
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<tr>
<td>Used initial prompts but insistence on the pupils making the decisions throughout the day.</td>
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<td>Pupils were allowed to work in subgroups, often based on gender, which later resulted in conflict.</td>
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<td>Restricted choices in order to make it easier for pupils.</td>
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<td>Controlled decision making very tightly and as a result the pupils relied on the trainee to support the decision making.</td>
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<td>Pupils were allowed to choose where they worked and supported to move around. This allowed pupils to observe and copy other groups’ strategies.</td>
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<td>Asked pupils to vote but struggled to manage the continuing conflicts.</td>
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<td>Happy to adapt activity and allowed pupils to make more than one product to present at the final presentation.</td>
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<td>Restricted pupil to pupil interactions and imposed more adult to pupil interactions.</td>
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<td>Pupils were each asked to produce a design then asked to vote for the best idea.</td>
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<tr>
<td>Asked pupils to work in one area chosen by the trainee and so were prevented from observing other groups’ progress.</td>
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<tr>
<td>Pupils were each asked to produce a initial design, then asked the group to combine all the best features into one product for the final design.</td>
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<tr>
<td>Allowed the group to split into two and ran parallel design and make activities, but could not manage the disappointment of pupils whose design was not chosen.</td>
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Figure 1: Trainees’ strategies used to initiate social interaction.

Figure 2: Trainees’ strategies adopted to manage pupils’ decision making
There were a number of creativity inhibitors that affected trainees who perceived they were not able to manage pupils’ decision making within the pupil groups during the selection of the user and purpose of the new product and the choice of the group’s final design. These were an inability to manage the group dynamics due to conflicts; restriction of choice for pupils and a restriction of freedom (Benson and Lunt 2011; Fasciato and Rogers 2005; Hamilton 2007; Kruger 1993).

The trainees were invited to grade their response to the statement ‘I was surprised by the way in which the pupils worked’. Two trainees were undecided and one noted that ‘the children I worked with did not really work together well; they struggled to come up with ideas.’ Another noted that the pupils were ‘well behaved, polite, listened to each other’s views but the team separated into 4 teams for the task.’ Observing one pair of trainees work with the pupils, I noticed that they were unable to master the strategies for supporting independent work as they appeared to be incapable of letting the pupils work independently, thus making these trainees the creativity inhibitors.

Twenty five per cent of trainees who struggled to initiate the product analysis found that the pupils continued to express ideas, investigated the vacuum cleaners on a superficial level and relied on a high degree of prompting from the trainee. Eighteen per cent of the trainees tightly controlled the structure of the day and perceived that their group of pupils struggled with creativity. When investigating potential users and purposes, these pupils could only think of three or four users and purposes for the new product. During the design stage these pupils also produced a limited amount of design ideas and these were generally variations of one idea, (Figure 3).

![Figure 3: Pupils' ideas from tightly structured activities.](image)

In contrast thirty one per cent of trainees who were prepared to take a risk produced a greater and more diverse range of ideas for potential users and purposes. (Figure 4) This demonstrates a need to work with trainees to find ways to support them to be able to take risks (Fasciato and Rogers, 2005; Musta’amal et al 2009).
Trainees who allowed pupils to work in sub groups, often based on gender, then struggled to support the development of initial ideas and as one trainee noted, critical thinking. One trainee expressed the view that it was more important for pupils to be happy than follow the brief for the day again exposing a reluctance to engage with taking risks and losing sight of the need for ‘collaborative interaction and imaginative engagement’ (Hamilton 2007:27).

However the trainees who managed to support more creativity in the pupils’ outcomes used a variety of strategies which included:

- Restriction of choice at moments of pupil indecision;
- The ability to support pupils’ decision making;
- Take risks and let pupils self-direct activities;
- Minimal interventions;
- Judgement of when to intervene;
- Encouragement of pupils to think or use resources in different ways.

It could be argued that success occurred when pupils and trainees were empowered by ‘collaborative interaction and imaginative engagement’ (Hamilton 2007:27).

One trainee noted that-

“Allowing the children to control the design process was also beneficial. When I and my partner tried to control the situation, the children’s ideas didn’t come very easily, but as soon as they were allowed to control the situation and take charge, the design process flourished. Also working in groups was valuable as children saw more ideas and combined them to make a more complex idea.”

This statement illustrates how this trainee has used the design challenge to realise that pupil led design and technology activities can support social interaction (Trebell 2007) and thus pupils’ independence (Hamilton 2007).

Another trainee realised that risk taking (Musta’amal et al 2009; Fasciato and Rogers 2005) and experimentation were crucial (Fasciato and Rogers 2005) and noted that-

“I found it difficult to allow the children to experiment with all the materials because I am so used to suggesting ideas. Yet I recognised that this was an opportunity for the children to be inventors and to use investigation to decide the best way to make their prototype. In order to solve this, I took a step back and observed the way in which the
Conclusion
Using Benson and Lunt’s (2011) four creativity factors to examine the pedagogical strategies used by the trainees during the design day, it is apparent that there were some specific areas of difficulty for the trainees. It could be argued that the pupils were provided with an opportunity to be creative through challenging opportunities with self-directed activities and as McCellan and Nicholl (2008) state, this should support creativity. However the trainees perceived a number of creativity inhibitors when supporting pupils and struggled to manage the ownership and control (Benson and Lunt, 2011) and struggled with supporting creativity. Most trainees recognised that more a risk taking approach was needed during the day but a minority of trainees struggled with this approach and reverted to restricting pupil’s independence throughout the day and this appeared to have a direct and negative influence on the pupils’ creativity. Twyford and Burden (1997:1) discuss ‘the dynamic interaction’ needed and pupils who were allowed more interaction with each other produced more original work with a greater variety. Pupils who were restricted to peer to adult interactions had less creative outcomes than pupils who were allowed to use peer to peer interaction for the majority of the challenge.

Researchers (Benson and Lunt, 2011; Fasciato and Rogers, 2005; McCellan & Nicholl, 2008; Trebell, 2007) point out the importance of the teachers’ influence on creativity. The trainees appeared to encounter a range of classroom management problems during the challenge day and these generally centred on supporting the interaction with others and providing ownership and control (Benson and Lunt, 2011). When supported, collaborative interaction between peers and greater independence empowered pupils and some trainees and in turn provided opportunities for experimentation and risk taking.

One of the main creativity inhibitors in supporting pupils’ creativity for trainees appeared to be the support of decision making within the pupil groups during the selection of the final design and managing the group dynamics. Successful strategies used by some trainees included an insistence on pupils initiated design decisions and providing strategies for the selection of a final design and adaptation of the design brief. The few trainees, who really struggled with decision making, resorted to a reliance on strong control and adult dominated activities. This echoes problems identified by Fasciato and Rogers (2005) and Benson and Lunt (2011) and is not the collaborative interaction as described by Hamilton (2007). ‘Musta’amal et al (2009) point out that this is a key process within creativity but for a minority of trainees, this appeared to be too daunting.

The environment of the design challenge day produced its own tensions as one of the main creativity inhibitors for trainees was the initiation of the work with pupils. The use of a design challenge day arose from the idea of a technology fair (Mettas and Constantinou, 2006) and while it created its own tensions, it provided a rare opportunity for Primary Education trainees to focus on pupil initiated design and technology activities and provided trainees an opportunity to review and change their own practice (McCellan and Nicholl 2008).

Davies (1996) also puts forward that pupils need prior experience of materials and techniques for creativity through modelling to develop. During the day the pupils were not taught specific skills however some trainees perceived that experimentation with a range of materials combined with curiosity produced imaginative results. Using the NACCCE definition of creativity as ‘imaginative activity fashioned so as to produce outcomes that are both original and of value’ (NACCCE, 1999:29) the pupils outcomes were at their best imaginative, original and directed at a specific user and purpose. There was a direct relationship between the trainees’ pedagogy and the levels of creativity in the pupils’ outcomes.
At the start of this study, I wanted to know what effect the trainees’ interventions had on pupils’ creativity and what difficulties did the trainees encounter when supporting pupil initiated activities. This was a small scale study but it is clear that the trainees in this study had some specific difficulties and so to further investigate trainees’ problems with the support of pupils’ creativity, this study forms the first part of a piece of on-going action research which aims to provide trainees with a tool kit of pedagogical strategies to overcome creativity inhibitors.
References


