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Creating the Climate for Design and Technology in the Primary Classroom

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Biographical notes
Robert Bowen BEd (Hons), MEd, PhD is course leader for the BA (Hons) in Primary Education with Qualified Teacher Status at The Nottingham Trent University. He has been actively involved in the development of primary design and technology for the last 20 years. His current research interests are focused on the development of planning and teaching methodology for primary design and technology.

Abstract
This paper focuses on the role of the teacher in creating an effective climate for design and technology. In it I detail argument about necessary qualities of the role and explore how these understandings were gained through reflection on personal practice. I draw its findings from an extensive piece of research carried out in four schools over five years. Findings include commentary on teaching characteristics and teacher child interactions.

Keywords: primary, classroom, teacher characteristics, action research

Introduction
In this paper I explore the role of the teacher in creating an effective climate for design and technology. Crucial to the argument is the debate about the necessary professional qualities of the role. I explore how these understandings were gained through reflection on personal practice using action research methodology. I draw its findings from an extensive piece of research carried out in four schools over five years and include commentary on teaching characteristics and teacher child interactions.

Research methodology
The research methodology resides within the “educational action research paradigm”. Lewin (1946) developed the basic principles of action research – it is participatory, it is democratic and it is attempting to effect social change. My rationale for this approach was very clear; to explore my understanding of planning and teaching in the primary classroom I should engage in it.

Research methods
Within this educational action research context the approach used to gathering data was pluralist in nature. Walker (1985) argued the case for the power of multiple methods.

“The power of multiple methods flexibly used should not be underestimated. What at first sight appear to be not very rigorous methods, such as open interview and unstructured observation, become much more powerful when used in conjunction with each other.” (83)

The methods I used included:

• Teaching and Learning Questionnaires
Teachers used these when in an observer role to collect data about the effectiveness of the planned activities whilst teaching and learning was taking place.
• Summative Interviews – teachers
A review of activities that took place at the end of each teaching session.
• Introspective Notes
Immediately at the end of each activity – teaching, discussion with teachers, head teachers, tutors, etc. – I made ‘free thinking’ notes in an attempt to capture instantaneous interpretations of the situation recently met.
• Summative Questionnaires/Interviews – pupils
A review of the ‘unit of work’ at the end of teaching it.

To analyse the data generated by the above methods I made use of ‘reflexive critique’. This process has three phases:
“1. Accounts will be collected such as observation notes, interview transcripts, written statements from participants, or official documents.
2. The reflexive basis of these accounts will be made explicit,”

so that

“...claims can be transformed into questions and a range of possible alternatives will be suggested, where previously particular interpretations have been taken for granted.” (Winter 1989, 43)

I then illustrate the findings through vignettes:

“A vignette has the status of a sketch as compared to a fully worked picture. Invariably interpretative, it is founded on the act of selection of a subject for the vignette which itself constitutes an interpretation, and the illumination of the observation, situation or event by the selection of features whose meaning is determined by the author’s interpretative stance.” (Stenhouse, 1978, 269)

The empirical research was carried out over three cycles each lasting two terms. This work generated case data through teaching activity and reflection upon it. I compiled accounts of the work into case studies and colleagues in schools commented on their accuracy. The ethical stance in the work is one of anonymity for school based participants.

Findings
At the outset of the work I posited that to be an effective design and technology teacher four ‘characteristics’ needed to be present in the teaching/learning environment:

• a teaching style where the teacher does not have ‘the answer’ but is seen as facilitating children’s learning
• a classroom that is ‘child centred’ rather than ‘teacher centred’
• learning which is action based as distinct from content driven
• a teaching methodology founded on the recognition that from the child’s point of view the realisation of the product is a key feature of the activity, but that from the teacher’s point of view it is the process that leads to the product that is crucial.

I subjected these ideas to reflexive critique. Here I describe my findings and pose reflexive questions which the reader might wish to ask of their own practice in order to create an appropriate climate for teaching design and technology in their classrooms.

Reflexive critique – Was there evidence of teacher action that could be seen as facilitating children’s learning rather than giving answers?
Facilitation, in the sense it is used here, means the teacher creating a learning environment that has a structure, which allows children to progress in their learning activities. This may require the teacher to give answers or didactic inputs but these forms of teacher action need to be balanced with the generation of an inquiring classroom climate in which the children to ask questions of themselves as well as of the teacher. The data demonstrated that a focused practical task (FPT)/designing and making assignment (DMA) (DFE, 1995) approach is facilitating of this kind of teaching approach. Further, I found that there was a need to plan FPTs within a DMA so that the two forms of activity work together symbiotically.

In your actions as a teacher do you consider:

FPTs in relation to a DMA so that children are both supported by your inputs but also enabled to explore through asking questions of themselves as well as of the teacher and others?

Reflexive critique – Was the nature of classroom activity child centred?
‘Child-centred’ or ‘progressive’ education stresses ‘learning’ rather than ‘teaching’ and focuses on the child’s perceptions of reality rather than an adult interpretation of the world. However, in starting with a
consideration of the activity and experience that the child will engage in it is easy for the teacher to lose focus and forget to ask the all-important question of activity and experience to achieve what? The role of the teacher as illuminated by Bruner (1960) is to set up a learning environment appropriate to the child’s level of understanding; I would see my activity within this concept of child-centeredness. Fontana (1978) explores this notion:

“What they (progressive educationalists) ... really mean is that all the experiences encountered by the child have a potential influence on his long-term development. Thus these experiences cannot be viewed simply as ends in themselves.” (xiv)

I see myself as a progressive educationalist in terms of a focus on activity based learning but also one who sees consideration of the knowledge component in a ‘traditional’ sense as important. The data showed that within FPT activities the child is less at the centre of the learning and the teacher has more control over the knowledge component than within DMAs where the child is more in control of their experiences and more interest driven. It is obvious that DMAs are more child-centred than FPTs and again to generate an effective learning climate requires consideration of children’s activity within FPT/ DMA relationships.

**Reflexive critique** – Was children’s learning action based rather than content driven?

Design and technology is intrinsically an action based subject. Engagement with designing and making requires children to be active cognitively and physically. However, actions need to be to some purpose and obtain to some content, so there is a contradiction in this statement. Content based learning is required, but this is not the antithesis of action based learning. Within focused tasks, which could be seen as content driven, children were involved in active learning, but this was often to cover content required to address successfully integrating tasks, which could be seen as action based.

When considering the FPTs and DMAs offered to children do you analyse learning intentions to that essential skills, knowledge concepts and attitudes are covered and ensure that the child has control over some of their own learning outcomes?

**Reflexive critique** – Was the teaching methodology founded on the recognition that from the child’s point of view the realisation of the product is the key feature of the activity but from the teacher’s point of view it is the process that leads to the product that is crucial?

Clarification and interpretation of how I achieved these teaching characteristics began to emerge during the second school-based cycle of my work. This seemingly ‘open’, ‘child centred’ approach was only possible due to the considerable amount of thinking that went into the structure of sessions. It was dependent on my ability to see an end point and “backward chaining” (Stones, 1968) to an appropriate starting point given the previous experience of the children. The key feature of the approach is unpacking the activity effectively, to plan the teaching in appropriate steps starting from where the children are and taking them to where you want them to be, whilst encouraging children to express their ideas within the framework established by the teacher.

Making judgements about appropriate levels of teacher intervention is also a difficult area. Even in the most open of DMAs there should still be a need for FPTs, if not the activity is not challenging the children, the teacher’s role here is clearly facilitating. In open-ended situations the teacher often has to intervene to make the activity progress. Schon (1983) develops the concept of ‘professional artistry’ to refer to the complex interactive processes of decision making where uncertainties abound. His view of teaching is that of the professional artist, bringing to bear broad range of skills and knowledge in some almost magical way and thus exposing the learner to his or her artistry. The nature of teaching in design and technology requires the application of professional artistry.

“We should start ... by asking what we can learn from a careful examination of artistry, that is, the competence by which practitioners actually handle indeterminate zones of practice...” (Schon, 1983, 13)

During Cycle 2 I identified three key constituents of my artistic role that were explored during Cycle 3:
1. The nature of my teaching inputs.
2. The nature of the teaching resources I was going to use and practical resources I provided for children to use.
3. The nature of the children’s activity as directed by my teaching inputs and the resources I supplied.

My understanding about the importance of class teaching was one that developed substantially during my research. Prior to this I would have said that rotating groups was the most effective way of handling the subject. I now believe that whole class teaching is much more effective for areas of the subject such as designing and evaluating. Providing sufficient equipment is available, making is also possible in a whole class situation. A key determinant of the decision to class or group teach is teacher knowledge.

The resources to support my teaching and the children’s learning were also very varied and highly influential. For example:

“having that large wheel (to show to the children when introducing wheels and axles) was a kind of visual demonstration. That helped what they were doing.” (Class teacher)

“One of the things I think the kit work is trying to do is to get a kind of reality into what might be possible to make when they come to make it (in resistant materials).” (RB)

“That’s right.” (Class teacher)

“Why do you think that worked? It was working well wasn’t it? I wasn’t particularly hassled, neither were you.” (RB)

“Yes. Because the resources were adequate, nobody was queuing up ... there was plenty of room to work using outside (the classroom).” (Class teacher)

The combination of carefully planned teaching and resourcing resulted in an effective teaching environment. The vignette below constructed from Cycle 3 data illustrates this:

During the four research units in Cycle 3 I used a consistent approach to the teaching and asked a consistent set of questions about my role as a teacher:

The kind of teaching input being carried out was enabling. The formal inputs guided the children by asking key questions. These questions were repeated during the more independent work as a way of directing the children. Generally the structure of a teaching session was to start with some form of didactic input then move the children towards more open-ended activities. However, there were also inputs which drew the children together either in groups or as a whole class. This was normally to re-focus or to give some formal input. Much of the teaching was trying to get children to decide for themselves, guiding them to think for themselves.

The children knowing what to do enables child centeredness; the children were being in charge of their own procedures. The use of ‘pupil planners’ helped here. The children’s understanding of their progression through the task was good. The balance between the development of procedural and subject knowledge enabled the children’s activity.

The availability of appropriate resources helped the children to focus their thinking:

This form of teaching was only possible with good classroom organisation. The clear structure in the teaching enabled the children to progress – the purpose of the FPTs was clear and because the children had subject knowledge to work with this allowed for creative responses. However, there is a need to consider how many FPTs. Too many can get boring – the balance of FPTs within the DMA needs to be thought about carefully. The constraint allowed creative responses because the balance between open activities where the children were working independently and teacher controlled work was normally good.
The children discussing the work they had made illustrated their knowledge:

It is clear that the product is important to the children but that the process is key for the teacher. The teacher is planning for children to go through a process in which children’s previous knowledge and that taught specifically through the FPTs is used to achieve a product that the child desires.

More than just being effective in a practical sense, Cycle 3 evidenced that tightly structured planning enabled children to make creative responses in their design and technology activity. For example:

“They were being creative … you gave them a lot of input … and they took it as far as they could. I don’t think it was a case of ‘well I’ll just have that’ they really thought about it … it was a very practical and creative lesson.” (Class teacher)

This was due to a number of factors. These included planning for children to have the resources of subject knowledge and skill, gained through the teaching, and the physical resources to hand; planning for the development of procedural knowledge alongside subject knowledge and putting children in situations where there was no ‘right’ answer – a design situation. It my view this is the key to effective planning and the essence of deconstruction. What we are attempting to do through the deconstruction of DMAs into FPTs is to establish a foundation on which to build children’s learning. In Vygotsky’s terms to move children through the ‘zone of proximal development’, which he defined as the distance between a child’s actual developmental level as determined by independent problem solving and the higher level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky, 1978, 68) A creative learning climate is engendered by a highly structured environment in which teaching inputs are carefully worked out to facilitate children linking from the known to the new.

When planning do you deconstruct DMAs into linked FPTs in which children’s learning is guided from the known to the new?

**Conclusion**

To create the classroom climate described above requires a highly structured approach that is appreciative of the children’s existing knowledge, but also giving them additional knowledge, skills to have confidence to perform creatively. The development of planning techniques that provide activities (FPTs) which enable children to progress their knowledge and skills through an effective sequence of projects (DMAs) is essential to effective design and technology teaching. The sequencing of learning should be of paramount teacher concern.

The conceptual planning necessary to achieve these ends requires the teacher to develop further notions of professional artistry, which includes abilities to:

i. deconstruct the DMA into associated FPTs by backward chaining and, consequently determine the nature and sequence of teaching inputs;
ii. plan the organisation of the children into whole class, groups, pairs or individual activities based on the learning intentions; recognising that whole class teaching can function well for aspects of design and technology teaching;
iii. organise and provide resources that support children’s learning;
iv. interact with the children and resources to provide a dynamic learning environment that stimulates children to be creative whilst ensuring that that they progress at the limits of their expertise.

I hold an unclouded view that children’s creative actions occur within a well organised, supportive environment. The teacher’s role in design and technology is to provide such an environment. This is a key to professional artistry.

**References**