

Show-how know-how: Part 1

Theory and practice for demonstrating in design and technology

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'Demonstrations are the single most effective method for [design and] technology teachers.' (Petrina, 2007: 1)

The **demonstration** is an important element of practical education, and in particular design and technology. So it is surprising to find that little has been written about the pedagogy¹ of demonstrating in the subject. How could this be? Is it because it is considered to be such an elementary skill? Or is it a tacit skill learnt in initial teacher training? Working with, and copying, experienced teachers in schools, colleges and universities.

'When education...fails to recognise that primary or initial subject matter always exists as matter of an active doing, involving the use of the body and the handling of material, the subject matter of instruction is isolated from the needs and purposes of the learner.... Recognition of the natural course of development, on the contrary, always sets out with situations which involve learning by doing.' (Dewey, 1916)

Having taught design and technology with children and young people in the primary, secondary and post-16 key stages, and observed beginning teachers in their training, we are becoming increasingly concerned that this may not be the case and there is a risk of losing this crucial pedagogical skill. In our opinion effective demonstration requires four things:

- good subject knowledge and understanding.
- a competent and confident level of practical² skill.
- a knowledge of pedagogical techniques and strategies.
- an understanding of how children learn.

Before we look at the factors that make an effective demonstration, it is appropriate to define what we mean by 'demonstration'. A demonstration includes a combination of teacher **modelling**, **explanation** and **questioning**; each of which do not define demonstration, in themselves, but are pedagogical strategies that the effective design and technology teacher employs when demonstrating. The National Strategies Pedagogy and Practice series gave these descriptions:

¹ The theory and practice of teaching, learning and assessment.

² By practical we mean a range of skills from hands-on making and using machinery/equipment, to designing and other cognitive (thinking) skills. In other word, learning by doing.



'Modelling is an active process, not merely the provision of an example. It involves the teacher as the 'expert', demonstrating how to do something and making explicit the thinking involved.' (DfES, 2004a: 3; emphasis ours)

'Whether helping learners to acquire basic skills or a better understanding to solve problems, or to engage in higher-order thinking such as evaluation, questions are crucial.' (DfES, 2004b: 2; emphasis ours)

'The purpose of explaining a process or procedure is to help pupils understand how things happen or work. The emphasis is on sequence and connectives such as first, next, then and finally are important.' (DfES, 2004c: 3; emphasis ours)

It is also crucial to acknowledge that the skills demonstrated in design and technology cover a wide range from the manipulation of physical tools and materials (making), to virtual tools (software, including CAD/CAM) and cognitive tools (design thinking). Each of these skill domains has similar features and problems (as explored in this series of articles), as well as distinctive differences (relating to the learners, context, equipment and materials).

Types of demonstrations

Put very simplistically, there are two types of demonstration, each of which can take a range of forms: the planned demonstration and the spot demonstration ('spot-dem'). In planned demonstrations, the teacher may begin a lesson with a demonstration or plan to deliver it later in the lesson 'just in time' for the planned activities. Depending on the age, ability and prior experience of the learners, a demonstration may be 'chunked' (broken into smaller sections delivered at intervals). It is a skill in its own right to determine the appropriate points to create mini- or sub-demonstrations so that the process and skills remains coherent to the learners.

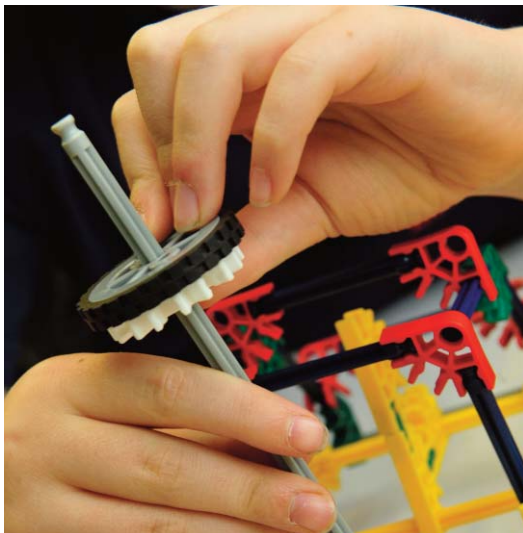
The spot-dem is a responsive demonstration to observations made by the teacher within a lesson; for example, when learners appear to have misunderstood an aspect of the process or are acting in an unsafe manner. The skilled and experienced teacher will often be able to predict whether such a demonstration might be required. Whereas the beginning teacher is wise to plan for the 'unexpected' or for a 'floating' demonstration that may or may not be used, or have an element of variability in the timing.

'Organisation and communication are the keys to effective demonstrations.' (Petrina, 2007: 1)

The planning of demonstrations

The planning of demonstrations can be a particularly tricky affair for the beginning teacher, but there are four maxims that are invaluable. **Firstly**, always complete the task or skill that you are demonstrating at least once before teaching it. **Secondly**, use the same materials, equipment and setting that the learners will be using. **Thirdly**, gather all the resources (tools/equipment and materials/components/ingredients) that will be needed and have them close to hand – working closely with a technician can be invaluable on this one. **Fourthly**, practice the demonstration including explanations and questions – doing this with a peer, in front of a mirror or a video camera can give useful feedback.





Watching beginning teachers demonstrate often shows a pattern of behaviour and stages of development, even where the individual is highly skilled. Remember when demonstrating, a teacher is not merely enacting (doing) a skill but modelling and explaining it as well. These stages approximate progress (as part of a continuum) that a typical novice demonstrator moves along, at varying rates depending on the individual and context:

1. **Demonstrating to your hands**, where the individual's concentration is on the task or activity.
2. **Demonstrating to an individual** directly in the individual's field of vision as confidence grows and they can look up occasionally.
3. **Demonstrating to a wider audience** as the individual consciously scans the room when lifting their eyes from the task.
4. **Demonstrating and multitasking**, while being conscious of learner movements and activity in the peripheral vision (demonstrating, talking and scanning the room concurrently).

The latter stage occurs when the teaching and practical skills have become tacit, in-built and to some degree unconscious (somewhat like driving a car). The precise format and structure of each demonstration will differ according to the **content** and the **learners**, but there are several common components (Figure 1; Petrina, 2007), where health and safety and safe working practices are embedded throughout the process.

In Part 2...

In the second part of this article, we will look at some of the practical aspects of demonstrating practical skills and knowledge, under the headings:

- visual communication in demonstrations.
- verbal communication in demonstrations.
- scaffolding of demonstrations.

References

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Dewey, J. (1916). *Democracy and Education – an Introduction to the Philosophy of Education*. New York: Macmillan.

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Figure 1: the Four Cs of demonstrations (based on Petrina, 2007: 14)

Component	Petrina's description
Coverage	Introduction (What will be demonstrated?)
Context	Relevance (Why demonstrate this?) (Use Questions, Story, Description, etc.) [Context or implications (personal, current concerns, historical, psychological, sociological, etc.)]
Content	Use of application, instrument, machine, process, or tool (How to effectively and safely do or use this?) (Actual execution of proposed process)
Conclusion	Conclusion (Recap-Summarize, What was covered-Where to go next?)

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