

TEACHING & LEARNING

LESSONS FROM PSYCHOLOGY



RICHARD FOX

TEACHING AND LEARNING

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Lessons from Psychology

Richard Fox

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Foreword

Ted Wragg

Many books have been published on the psychology of teaching and learning. Some are strong on teaching but not so hot on learning, whereas others are the opposite way round. Several have been put together by psychologists with tenuous links to the classroom, while a number have been written by people well tooled up to teach children but rather rustier on the central precepts of educational psychology.

The strength of Richard Fox's book is that it is well grounded in all these areas. As an experienced educational psychologist, Richard has a formidable grasp of both the theory and applications of psychology. Moreover, as a teacher and teacher trainer, he understands the intricacies of daily life in the classroom. Few people can match that sort of range, which is why this book has such all-round credibility.

Another strong point is that the book takes a very broad view of psychology, spilling readily over into philosophical or sociological issues when the need arises. The school curriculum, classroom processes, individual issues like 'motivation', 'assessment' or 'bullying' cannot be seen in isolation. The context in which they occur, and the principles and values on which they are built, are also part of the wider teaching and learning story.

The climate of the classroom is effectively captured by the frequent use of transcript and illustration from real lessons. Teachers often find books on teaching and learning remote from their everyday experiences and aspirations, so these classroom examples help to bridge what can sometimes appear to be an almighty gulf between theory and practice.

I have no doubt that this book will be of immense value, not only to student teachers and their mentors but also to experienced teachers who think deeply about their craft. Teaching is both an art and a science. It can perhaps best be seen as an art form with a scientific and philosophical foundation.

Medical practitioners are highly esteemed as a profession for the substantial background knowledge on which they are able to ground their craft. Teaching is also a professional activity which can and should be evidence based. Even those who like to busk it will be fascinated by the many insights in this thoughtful and well-researched book.

Acknowledgements

A book such as this has a long intellectual history, strewn with debts all along the way. I would like to thank especially my friends and colleagues at the School of Education, University of Exeter, who, for a period of some ten years, involved me in the friendliest way in their 'long conversation' about education. I am also more indebted than I can really say to all the teachers, particularly in Devon, who have allowed me to watch them at work and to learn from them.

Professor Charles Desforges deserves my special thanks because it was he who initially involved me in this project and who has continued to help me make sense of it. I owe thanks, also, to Maureen and David Lewis for reading and commenting on sections of the book, when they were already too busy, and to Liz and Tony Clayden for their support and encouragement with my writing. To my three anonymous reviewers I send sincere thanks for pointing out many errors and for making a number of helpful criticisms. One of them, a newly qualified teacher, actually gave up part of her precious half-term break to do this work, which is dedication of a high order. Her criticisms and insights were much appreciated and I hope have made this a better book. I also wish to extend my thanks to Will Maddox and Sarah Bird at Blackwell Publishing, who backed me to carry out the project and have helped me throughout with great tact and professionalism.

Finally, I thank my wife, for her love, patience and support over many, many years as well as for helpful criticisms of this text as it emerged.

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Introduction

This book is for anyone who is interested in teaching. It started as an attempt to map out and summarize reliable knowledge about teaching and how it functions to aid learning. It was written, in the first place, mainly for students training to become teachers and for newly qualified teachers. In the course of writing the book, it has turned into something of a personal exploration of the territory, a selection and interpretation of the research that I now feel to be most significant for all teachers. It takes, as its context, the school system in England and Wales, with its National Curriculum, its four Key Stages and its national assessment regime. (Brief notes on this system for those not familiar with it are provided in the section on pp. 4–6.)

When I started teaching, some 30 years ago, I was a graduate in psychology, but I was soon made aware both of how little that qualification helped me in the classroom and of how meagre the literature was in those days, which could have given me a useful foundation of knowledge for teaching. Since then, I feel that the situation has gradually and steadily changed for the better. For those who possess some intellectual curiosity and a readiness to learn, it is now possible to set out a great deal of useful general knowledge about teaching and learning. It may be difficult to apply, but it can still provide a valuable context to essential practical experience. This is the claim that, more than any other, underpins the present book.

Teaching is frequently an emotionally draining occupation. It is often physically wearing and psychologically stressful. People commonly become teachers because of their love of children and because of deep-rooted wishes to help other people. Teachers often make strong relationships with those they teach and yet have to retain an even-handed professional stance of interest and fairness towards all their students and, indeed, their parents. So absorbing is teaching as an occupation that it is hard not to take its issues home and worry over them, even during the night. Teaching is thus a job that demands much from the self, from the resilience and integrity of the person within. Although I know all this to be true, I have not referred to these strong feelings or to this sense of personal commitment very often in what follows. I do, in Chapter 16, look at the strong emotions and the investment of self

that are involved in becoming a teacher. For the most part, however, I have stuck to the cognitive side of the story, assuming that all teachers will discover the affective side of teaching for themselves soon enough, and that it is probably best discussed with those one likes and trusts.

The book attempts to cover issues of common interest to all teachers, or at least to those who teach students between the ages of 5 and 16. To this end I have tried throughout to give varied examples right across this age range and across different school subjects. (Apologies, in advance, for some subjects which get scarcely a mention: this does not reflect their relative importance but rather the availability of suitable examples.) This is a very ambitious undertaking and, in Chapter 16, I accept that teachers also need specialist knowledge, of one or more subjects, to become qualified professionals. Nevertheless I have been surprised to discover how much of the material seems as germane to Key Stage (KS)1 as to KS4, and how many issues impact on each and every school subject across the curriculum. Teachers perhaps have more in common than they realize. I also believe that all teachers will profit from understanding something about how things work in subjects and age groups that may be remote from their own particular 'patch'. Much of what I say is also relevant to the pre-school years and to post-16 teaching, but I have had to draw the line somewhere. Nor have I attempted to write about the broader social and political context of education. It is not that I think this context is unimportant, merely that there is not enough space to cover it here, even if I were competent to do so, which I am not.

It is an irony of educational research that we do not possess a really good model of how teachers develop from being novices to becoming experts at what they do. I am adopting a simple, and I hope robust, view here that this process involves building up knowledge and experience of three main kinds:

- practical knowledge, based on experiences of teaching;
- knowledge of how to teach particular curriculum subjects, to students of a given age range; and
- general pedagogical knowledge of teaching, learning, learners and schools.

This book makes its contribution to the third and last category. If you imagine each type of knowledge as residing in one of three overlapping circles, the region in which all three overlap is potentially of the greatest importance. It is here (I imagine) that teachers try to articulate to themselves how their teaching is actually done. Their specific practical experience has here to be interpreted in the light of what they know about how to teach this subject to this age group, and what they know about learners and about teaching in general. The specific knowledge should gradually illuminate the general and the general knowledge should inform the specific.

Some teachers probably rely almost entirely on practical knowledge and are not much interested in reading about teaching or learning, unless it be to discover some new 'recipes' for lessons. However, I confess I am not impressed by this stance. Who, aspiring to be a professional teacher, would not want to know as much as possible about this

fascinating job? Surely we owe it to the students we teach, and indeed to ourselves, to find out as much from other people and from research as we possibly can. If professionals are people who make professionally informed decisions and engage in professionally relevant actions, then these decisions and actions should be based on the best available knowledge, used in the best interests of their students. Moreover I maintain that part of the continuing interest of teaching, as an occupation, lies precisely in finding out more about how it works. Good teachers are also good learners.

Research is often written by researchers for other researchers and consequently is dense with technical language and difficult for the general reader to evaluate. Hence the need for books such as this, written as an introduction for a more general audience. I should come clean and admit that, in spite of the book's title, much of the research I review is educational rather than strictly psychological, though it often has its roots in psychology. I also confess that in writing it I have not been able to rely on objective and well-established research findings alone. In effect I have used my own experience, as a parent, a teacher, an educational psychologist and a teacher trainer, to provide some of the practical advice and underlying convictions that glue the various ideas of the book together. Thus I have drawn on 'craft knowledge' and on my own experience where I felt I needed to.

Inevitably I have been selective in the research that I have considered interesting and relevant and I have tried to concentrate on certain powerful themes and ideas. I have also drawn on my own values and beliefs where necessary in order to try to produce a reasonably coherent account. Where these intuitions, values and opinions have led me to steer things in a particular direction I have tried to make this plain. But without this kind of personal 'voice' breathing some life into the text, I believe that the book would be a duller and a less useful one. Yet I also have to concede that the reader will need to keep his or her critical faculties alive and alert, so as not to be lured unreasonably by my opinions into territory that lies beyond the path actually illuminated by solid research evidence.

The general plan of the book is a simple one. Part I consists of a course for beginning teachers in understanding what goes on in classrooms. It considers the repertoire of teaching in Chapter 1 and the main phases of learning in Chapter 2, together with how they match up with different sorts of teaching and tasks. Chapter 3 provides an overview of the social context of the classroom, as a very particular kind of environment for learning. Chapters 4 and 5 provide introductions to two of the immediate problems facing beginners, namely keeping order and planning lessons. Craft knowledge is prominent in Part I and there are regular examples of episodes from real lessons to illustrate the argument.

In Part II, I take a look at the main areas of research that have contributed to our understanding of learning, teaching and motivation. In this section, psychological and educational research findings predominate and we stray from the day-to-day demands of the classroom, while always keeping an eye on why the research matters to teachers. Thus, Chapters 6, 7 and 8 all consider learning, moving from the easiest and most natural varieties to the more difficult kind of deliberate learning that I believe is central to the work of schools. Chapters 9 and 10 look at motivation, first in

general and then more specifically in classrooms. Chapter 10 also includes material on teaching learners to manage their learning more effectively. Chapter 11 provides a sketch of the developing mind and its intellectual journey. Chapter 12 is about individual differences in intelligence and personality, and about the relative influence of parents and peers on learners.

In Part III, we return more directly to the classroom, to extend the coverage of teaching to a range of more advanced topics. Chapter 13 tackles special educational needs, together with bullying and child abuse. Chapter 14 looks at the impact of gender and ethnicity on schooling, whereas Chapter 15 focuses on the vital topic of assessment. In the last chapter, Chapter 16, I consider the development of subject expertise, what we know about teachers' knowledge and its growth, and the demands made on teachers as professionals.

I had better admit, as we set out on this tour of an enormous landscape, that in spite of much helpful advice from friends and colleagues, I am bound to have left some important places unvisited and to have got lost now and again. I hope these shortcomings do not disfigure the book too much. The remaining mistakes are all my responsibility.

I have used the term 'student' rather than 'pupil' throughout the book, although with some misgivings. I think this is because 'pupil' is beginning to sound a touch old-fashioned and patronizing, whereas 'student' is more neutral, even if its range does not usually include 5 year olds. Throughout the book there are examples, questions and exercises for the reader to try out, as a means of engaging with the text and trying to learn from it. There are lots of cross-references between chapters, to help the reader make links between related sections. Thus numbers in parentheses, such as (10.2), refer to a chapter (10) and a section (2) where other material on the same topic can be found. The book can be read in any order, but there is no penalty for starting at the beginning and working your way through to the end.

Notes on the school system of England and Wales

Most of what follows is true throughout the UK, although Scotland and Northern Ireland retain control over their own educational systems. Children are currently required by law to attend school between the ages of 5 and 16. Many children start school at the age of 4+ years and continue beyond the age of 16. Teaching is organized via a National Curriculum in five age groupings as follows:

Foundation stage (age 3–5 years): pre-school and Reception (R). This has its own curriculum, with early learning goals in six 'areas of learning'. An obligatory assessment in the form of a foundation stage profile is made on entry to KS1.

KS1 (age 5–7 years): Year (Y)1, Y2.

KS2 (age 7–11 years): Y3, Y4, Y5, Y6.

KS3 (age 11–14 years): Y7, Y8, Y9.

KS4 (age 14–16 years): Y10, Y11.

Many, but not all, schools are arranged as either primary schools (KS1 and KS2) or secondary schools (KS3 and KS4). At KS1, class sizes are restricted to 30 or fewer pupils. About 94% of children attend maintained (or state) schools, with some 6% being educated in private (or independent) schools.

The National Curriculum was established by the Education Reform Act of 1988 and was revised in 2000. It applies to all pupils from age 5 to 16 in maintained (state) schools. It is made up of core subjects, i.e. English, mathematics and science, and foundation subjects, i.e. art, design technology, history, geography, information and communication technology, modern languages (at present from KS3 but in the future from KS2), music and physical education. Religious education, personal, social and health education, and citizenship are also compulsory subjects but are outside the full National Curriculum framework, having only 'non-statutory guidelines'. At KS4 fewer subjects may be studied.

Each core and foundation subject in the curriculum is organized around programmes of study (the content of the curriculum) and attainment targets (learning objectives arranged in a hierarchy of levels, from level 1 to level 8 plus one for exceptional performance). There are obligatory National Curriculum tests (formerly called Standard Assessment Tasks, or SATs) at the end of KS1, KS2 and KS3 in the three core subjects only. At the end of KS4, students sit a varying number of subjects for the General Certificate of Secondary Education (GCSE) at age 16+. Results for this examination are graded from A* (the highest) to G (the lowest).

In 1999, national frameworks were established for the teaching of literacy and numeracy, which were given protected curriculum time, known colloquially as the 'literacy hour' and the 'numeracy hour'. These had a significant impact on teaching across KS1–3 and were subsequently replaced by a broader 'primary strategy' and 'national strategy'.

The Department for Education and Skills (DfES) is the ministry overseeing the school system. It is assisted by the Office for Standards in Education (Ofsted), which is responsible in particular for the inspection of schools, and by the Qualifications and Curriculum Authority (QCA), which oversees developments in the curriculum, assessments and examinations. The Teacher Training Agency (TTA) currently has overall responsibility for teacher training. All these agencies maintain websites, as does the General Teaching Council for England (GTC).

There are some 423,600 teachers working full time in schools in England and Wales, with an additional 122,400 teaching assistants (figures from 2003); 48.8% of the teachers are in secondary schools, 46.6% in primary schools and 4.5% in special schools and units. There is considerable turnover in the teaching force. Currently some 31,000 individuals start on a course of teacher training each year, of whom about 88% complete their course and some 60% actually enter teaching. Although figures vary from year to year, around 20% of these newly qualified teachers leave the profession, at present, within 3 years of starting. However, some two-thirds of entrants stay on for 10 years or more.¹ Most students qualify as teachers via either a 4-year (undergraduate) Bachelor of Education degree or a 1-year Postgraduate Certificate of Education (PGCE). There are also some school-based and 'flexible'

part-time training courses. Student teachers work towards attaining **Qualified Teacher Status (QTS)**, after which they can seek to be employed in a maintained school and enter into an induction year as newly qualified teachers. Following further observations and assessments of their progress they may pass their probationary period and become fully qualified teachers.

The reader is warned that facts change rapidly in this field and an introduction such as this will probably date rather quickly. Useful basic websites include the following:

www.dfes.gov.uk
www.ofsted.gov.uk/
www.qca.org.uk/
www.standards.dfes.gov.uk/
www.nc.uk.net/
www.gtce.org.uk/
www.bbc.co.uk/learning
www.ngfl.gov.uk/
www.teachernet.gov.uk/
www.canteach.gov.uk/

NOTE

1. The figure of two-thirds comes from a speech by David Miliband, Minister of State for School Standards, given on 24 June 2003. Most of the other statistics quoted in this introduction come from the DfES Research and Statistics Gateway website (www.dfes.gov.uk/rsgateway).

PART I

Beginning to Teach



This part of the book introduces the main tasks of the teacher.

- Chapter 1 considers the repertoire of teaching, ranging from direct instruction, through interactive teaching to the setting and supervision of independent work.
- Chapter 2 relates teaching to a series of different phases of the learning process, from first encounters with a topic through to routine practice and revision.
- Chapter 3 considers the social world of the classroom as a special context in which to learn and work.
- Chapter 4 provides an account, with advice, on how to manage order in the classroom.
- Chapter 5 concerns planning and the design of lessons.

The Repertoire of Teaching

1.1 Introduction

In this chapter teaching as a professional activity in schools is introduced. The question of the kinds of knowledge that teachers draw on, in learning to teach, is raised, partly in order to clarify the function of this book. Teaching is analysed into three main categories:

- direct teaching and demonstration;
- interactive teaching; and
- independent practice and problem-solving.

These three different kinds of teaching are illustrated using transcripts of classroom lessons. The involvement of values and judgements in the business of schooling is emphasized and the way in which values enter into the life of classrooms is introduced via the idea of 'ethos'.

1.2 Teaching and Learning

Humans are specialists in adapting to their circumstances by learning. We carry our knowledge and skills about with us in our heads, in the form of memory, and this, to some degree, enables us to understand, predict and control our lives. Teachers work to aid learning. Schools have grown up as institutions whose special purpose is to ensure that a culture's most valuable knowledge is learned by its children. However, it is as well to realize from the start that much of this learning goes on out of school. Moreover, learning is always invisible and intangible and the learner does not necessarily even know that it has taken place. Schools concentrate resources for learning and attempt to generate the conditions in which many learners can benefit from them as efficiently as possible. However, any classroom is a compromise, with a

history, a budget and a timetable, where there are often conflicting views and traditions about what is worth doing and worth learning. Values, choices and judgements thus enter into schooling from the very start.

It is the teacher's job to organize and manage the learning environment in school and also to be sufficiently knowledgeable and competent to guide learners effectively through the approved curriculum. But the children, the students in schools, already have knowledge, values and habits that they bring with them. In the encounter between a teacher and his or her class, the mental world of the teacher meets the mental worlds of the students. Both students and teacher will probably learn from these encounters but it is far from easy to ensure that the students' learning is what the teacher intended it to be, or indeed that anything new is learned at all. For, in spite of a great deal of hard work and many excellent intentions, much of the activity that goes on in schools, although busy and conscientious, is more or less useless in terms of new learning taking place (see sections 3.6, 3.8).

How difficult is it to teach? Just as almost anyone can cook, in that they can boil an egg, almost anyone can do some simple teaching; it does not require special talents or training. We all act as informal teachers of one another, from time to time. Indeed we are generally adept at showing, telling, describing and explaining in our everyday lives, especially when we are confident and familiar with the topic we are dealing with, whether it be how to bake a cake or how to send text messages on a mobile phone. But teaching a class in a school, across the full range of the curriculum, is extremely difficult, just as cooking an ambitious menu for many clients in the pressurized atmosphere of a restaurant kitchen is very difficult. Although it may be easy to teach simply or badly, it is very difficult to teach 20–30 students consistently well. To become an expert in this field, as in so many others, it is essential to have practical experience over a prolonged period of time. In fact one of the greatest satisfactions of teaching is that good teachers continue to learn, for as long as they teach. To turn an old insult on its head, we may say that those who can, teach, and those who teach continue to learn.

1.3 How Teachers Learn

As well as the **deliberate practice** needed to become a good teacher, it is helpful to have some knowledge about what is likely to work. Some of this will come from watching other teachers at work and from talking with one's fellow teachers. But the claim of this book is that useful knowledge, and some valuable principles, can also be learned from the systematic research that has been done on teaching and learning. Much of this research is psychological in nature, although not all of it started off, or ended up, in psychology as a discipline. Increasingly, when it is carried on in classrooms, either with or by teachers, it is simply called **educational research**.

To some extent teaching is an art, for the teacher has to 'perform' his or her teaching in real time, making hundreds of spontaneous decisions about what to do

and say on the spur of the moment, guided only by some general principles and values and by a search for quality. There is also a good case for considering teaching as a craft, a set of repeated activities that have been shaped gradually into expert routines and habits through a long period of apprenticeship, and that are constantly adapted skilfully to the materials at hand. Much of the expertise of teachers is of this pragmatic kind, which I shall call **craft knowledge**. Craft knowledge can be summed up as a feeling for what works, learned from one's own experience and from that of others. However, there is also a body of knowledge, built up from research, which can inform what teachers do. Thus we can say that whereas the actual activity of teaching has elements that make it both an art and a craft, in its conception and planning teaching can draw on the findings of disciplined scientific enquiry. The most difficult trick is to use this knowledge fluently to inform the activity of teaching itself.

What is it, then, that skilled teachers do? It is time to take a look at some teachers at work.

1.4 Teachers at Work

I use excerpts from transcripts of teaching throughout this book. Describing lessons by way of transcripts of what people say is helpful, but necessarily limited. The bare words on the page are incomplete and all the expressive qualities of the speech, together with the non-verbal communication, are lost. Nonetheless, we can recapture some of what went on in these classrooms. Oblique slashes (/) mark a pause. An ellipsis (...) indicates a section missed out.

Example 1.1 Painting the sky: young children and art¹

A man, with a rich bass voice, is telling some 6-year-old Russian children a story about an old woman, a babushka, who goes for a walk to the woods in autumn. As he talks, he acts out the story.

Teacher: Oh, she walked along all crooked [*hobbles round the room with stooped back, eyes on the ground*], her back was old and bent, old and bent [*clutching painful hip*] and oh, the stiffness! And she came at last to the wood. She came to the wood and [*looks up*] raised her head, and what do you think she saw? [*Nominates a child, A, by bending towards her, still in babushka posture*]

Child A: [*Rapidly*] The leaves falling, the leaves falling.

Teacher: Yes! But that's not all she saw. / What else did she see?

Child B: [*Calls out*] The sky!

Teacher: [*Stands up straight and sweeps his arm in a celestial arc*] Yes! The sky. And [*bending towards B*] what was the sky like?

Child C: [*Calls out*] Light blue.

Teacher: Light blue, yes. Now, what we have to do is this. [*Clasps hands, speaks more earnestly*] We have to show this scene, with the leaves falling. [*Mimes falling leaves*]

That's what we have to make today. So, what do we have to start with? / What do we have to do first? Anyone?

Child D: The sky!

Teacher: Yes, we start with the sky. Right, let's open up the paints. Have you all got yellow, red, dark blue and white?

Students: Yes.

Teacher: Good. Now don't use any others, just keep to the yellow, red, blue and white.

...

Teacher: And now I need a *huge* brush, a really big brush to help me. [*Students hold up their paint brushes*] Oh yes, let me have that for a minute, can you? [*Takes brush offered by A and holds it up*] Now look, this brush is really large, so we'll be able to do everything we need to really quickly using this one, won't we? We can't afford to do it slowly, you know, otherwise we'll never be able to help Grandma, will we? Now look this way, please. The first thing you do is to dip the brush into the water, [*does so*] then get just a very little paint onto the end of the brush. [*Dips brush into paint. To two students who are standing up to look*] Sit down please, sit down.

Child E: [*Calls out*] Should we start from the bottom and work up?

Teacher: Of course! Now watch the way I do it. First of all, the bottom line [*paints a line across a piece of paper fixed to the portable blackboard, then recharges his brush*] and then some very little blocks, just tiny little ones, like this: one, two, three. [*Dabs small blocks of colour above the line and then rinses his brush*] And now what colour paint do we need? Which colour do we need just a little of?

Child F: Dark blue?

Teacher: Not dark blue. [*Charges his brush*]

Child F: Yellow?

Teacher: Yes. Just a little yellow, like this: one, two, three, four. [*Paints four more blocks of colour*] And now a few more strokes with the brush, what colour this time?

Child A: Dark blue!

Teacher: Dark blue, yes.

Child F: Lots and lots of it!

Teacher: [*Paints*] One, two, three, four.

Child G: And now we want some white.

Teacher: We want some white, yes. And in what direction do we put the white on?

Child G: In little blocks?

Teacher: I said in what direction? From the top or from the bottom?

Students together: From the top! From the bottom!

Teacher: From the bottom, yes. And this is the way I do it, do you see, [*painting as he speaks*] over everything else that hasn't been painted yet. Here we go! Here and here, and all over, and out comes a really beautiful sky. Now, [*gestures towards the class, returns A's brush*] you try it please.

In this first example, the teacher is the dominant figure. He takes charge and the students' job, in the first part of the lesson, is mostly to listen and watch. This is an example of our first kind of teaching: **direct instruction** and **demonstration**. It is perhaps the most obvious kind of teaching, occurring when a teacher tells students something they did not know before, or demonstrates a new skill to them, as here.

But telling students things, or even showing them skills, are not in themselves sufficient for learning to occur. **Assimilation** of new information, for example that you can use several colours to paint a sky, requires that the learner also does two things: (i) manages to fit the new information into his or her existing knowledge, so that it makes sense; and (ii) remembers it. If it does not make sense, the learner will not be able to use the knowledge sensibly. If it is forgotten, the learner will not be able to use it at all.

Exercise

Try, now, to make a brief list of the sorts of things that this teacher said or did, which you think would have helped these students to understand and remember how he painted the sky. Then read the analysis that follows.

Analysis of Example 1.1: direct instruction and demonstration

This teacher was actually not a professional at all, but a local painter who gave his time to this Russian kindergarten in Kursk, unpaid. He nevertheless teaches with confidence and skill. The general moves that he makes as a teacher, which are typical of this kind of teaching, are indicated in *italic* in what follows.

The teacher first shows a talent for *dramatic story-telling* and for *skilful demonstration*. Acting out the story of the babushka was a way of *engaging the full attention* of these young children. He also invited them to participate, by *asking them questions*. Their answers helped him to *gauge their understanding* and *drew them into the discourse*. Having *elicited contributions* from the children he often *confirms* and *repeats* them ('Yes, we start with the sky . . .'). But he is also prepared, on occasion, to give them *direct instructions* ('Now don't use any others . . .') or to *correct* them ('Not dark blue . . .'). He *informs* them, about the colours, the size of the brush and so on, in a clear and unfussy manner. He then *demonstrates* how to paint the sky, step by step, which probably both aids their learning and maintains their interest. No doubt his skill as a painter, as well as his *skills as a communicator*, were strong means of *giving the activity value* in the eyes of the children. Finally, he *initiates activity*, getting them to start painting, in imitation of his lesson, without delay.

We might note in passing that these young children have not yet been fully socialized into the strict Russian traditions of the classroom, whereby students have to raise their hands in an approved manner in order to make a contribution. They still shout out their answers, volunteer information and ask questions, from time to time. Yet the teacher is already beginning to shape their behaviour by his pattern of responses, without ever being harsh or deviating from the content of his lesson. In the Russian tradition, there is an approved way to begin the painting of skies, bound by rules and conventions, and the lesson has a strong element of direct instruction, which may make it a little unusual to Western eyes and ears. The lesson continued with the children doing their paintings. The teacher continued to instruct while **monitoring** their work and, finally, there was a **plenary** discussion in which the children viewed and commented on each other's paintings.

Example 1.2 Decimal fractions: KS2 maths²

The teacher of a Y4 class (8–9 year olds) writes '0.1' on his whiteboard.

- Teacher: Here's 0.1. What different ways could I use to describe this?
 Student: 10%.
 Teacher: Well done. What else?
 Student: One-tenth.
 Teacher: OK, what else?
 Student: 1 over 10.
 Teacher: Right. Now, if this [*writes 1.0*] is a centimetre on your ruler, what would this be [*writes 0.1 centimetre*]?
 Student: Half a centimetre?
 Teacher: Umm, might there be a problem there?
 Student: 1 millimetre.
 Teacher: Who agrees with 1 millimetre?
 Students: [*Lots of hands go up*]
 Teacher: Tell me why that's true. [*Indicates child*]
 Student: Because one-tenth of a centimetre is 1 millimetre.
 Teacher: OK, so how many millimetres in 1 centimetre?
 Students: [*Several voices*] 10!
 Teacher: What fraction of a centimetre is 1 millimetre?
 Students: [*Several voices*] A tenth!
 Teacher: Right, so 0.1 centimetres is the same as 1 millimetre. So, how could we write 3 millimetres? [*Indicates child with hand up*]
 Student: 0.3 centimetres.
 Teacher: And 9 millimetres? [*Indicates child*]
 Student: 0.9 centimetres.
 Teacher: Really good! Now, what if I write 12 millimetres? Be careful! [*Indicates child*]
 Student: 1.2 centimetres.
 Teacher: 1.2 centimetres, who agrees with that? [*Most hands go up*] Well, I'm really pleased. At the beginning of the year you wouldn't have said that! What about 26 millimetres? [*Indicates child*]
 Student: 2.6 centimetres!
 Teacher: Right. Nice to see all the hands going up.
 Student: [*A boy*] You just have to move it one place to the left!
 Teacher: Let's see who . . . here's one for those who are feeling clever, 123 millimetres? [*Indicates child*]
 Student: 12.3 centimetres!
 Teacher: OK, you've got enough information for the next part of my task . . .

Analysis of Example 1.2: interactive teaching

Interactive teaching is appropriate in a wide variety of situations. We use it when we want to awaken or rehearse existing knowledge, to practise routine skills or problem-solving and also when we want to extend knowledge. The students have to have some relevant knowledge in order to take part, but this knowledge may

be relatively poorly remembered, vague or fragile. Here, the teacher leads the whole class through a series of examples about representing decimal fractions and the relationship between centimetres and millimetres, using question and answer. Although not new to the class, these ideas have not been addressed recently. He is careful to proceed quite slowly until he gets the sense that the class understands. Then he tries some harder challenges. Interactive teaching frequently involves this mixture of:

- using questions to gain attention, initially;
- rehearsing what is known and applying it to exemplary problems;
- informally assessing the students' existing level of understanding and fluency, as a preparation for further work;
- arousing as many students as possible to participate actively in the exchanges;
- using easier and also harder questions to challenge differing levels of understanding across the same class.

There is an emphasis in this example on being able to represent the same mathematical concept in several different ways that are equivalent, so as to promote conceptual fluency in moving between representations (0.1, $\frac{1}{10}$, 10%). This is both a test of understanding and a powerful way of encouraging students to make links themselves. This teacher uses the strategy of 'Who agrees with that?' to try to get children to think for themselves and to commit themselves to an answer even if they have not raised a hand. He asks 'Why is that true?' to press them to justify an answer. He gives a prompt ('Be careful!') to warn them of a commonly encountered problem. He uses praise freely, praising not only their correct answers but also their willingness to participate. Several of his strategies can be seen as converging on the aim of building up the students' confidence in doing arithmetic. He is gentle with an early error ('Umm, might there be a problem there?'), makes a positive 'metacognitive' comment on the progress they have made during the year and challenges them with sensitivity ('Here's one for those who are feeling clever'). At one point, a boy attempts to generalize about the examples, but was not heard by the teacher.

This kind of interactive whole-class teaching has become very common in the context of the UK's literacy and numeracy strategies. It allows a single teacher to work with all the students in a class at once and to try to involve as many of them as possible actively in the lesson. Its organization is admirably simple and at its best it provides students with plenty of opportunities to learn, via listening or speaking. A tight rein can be kept by the teacher on the relevance of the talk and challenging problems can be set. In the example given here there is a high degree of concentration on the planned content of the curriculum (in this case maths) and a high apparent degree of attention by students to the task. The pace, in terms of both the rapidity of questions and the introduction of ideas, is brisk and this, too, seems to help with student attention. Teachers and students probably get a sense of satisfaction from successful examples like this as everyone can see and hear that appropriate work is being done, and celebrated. Besides, there is no time to be distracted or bored. The

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