Introduction

What do you need to know, to teach well?

What constitutes essential professional knowledge for teachers has been a topic for considerable debate. In Australia this has, at the time of writing, been settled through the implementation by the Australian Institute for Teaching and School Leadership (AITSL) of the Australian Professional Standards for Teachers. The Australian Standards have much in common with others that have been developed around the world; for instance, they feature three domains that are similar in content in most constituencies that have adopted teacher standards.

According to the Standards (AITSL, n.d.), the three domains of teaching are:

1. Professional knowledge
2. Professional practice
3. Professional engagement.

Each domain is further subdivided into individual standards. Professional knowledge is constituted by:

1. Knowledge of students and how they learn
2. Knowledge of content and how to teach it.

Professional practice is constituted by knowledge of how to:

1. Plan for and implement effective teaching and learning
2. Create and maintain supportive and safe learning environments
3. Assess, provide feedback and report on student learning.

Professional engagement is demonstrated by the capacity to:

1. Engage in professional learning
2. Engage professionally with colleagues, parents/carers and the community.

The Standards are a good summary of essential teacher knowledge; however, I believe that there is another body of knowledge that is required to help teachers to become independent professionals who understand the expectations of and pressures on their occupation and also to help teachers to act as advocates for their profession. That key additional knowledge is an awareness of the cultural context of teaching and the origins of the ideas that shape or attempt to shape teaching and schools. Schooling is generally regarded as highly significant because of the role that it plays in moulding future citizens and thus society itself. Unsurprisingly there are as many prescriptions for getting education 'right' as there are for what constitutes a good society. A well-informed teacher should understand at least a little of the origin of these ideas, the better to recognise them when they come knocking disguised as the latest policy prescription, criticism of teaching or demand on schools.

In Chapters 1 and 2 I shall introduce some theories that are very helpful for understanding and thinking about our culture, the debates that rage within it, and their effects on education. I shall also devote a large part of the book to addressing teacher professional knowledge, and especially understanding students and how they learn. Specific content knowledge and how to teach it is beyond the scope of this book, as is addressing the issues of professional engagement in any depth. I shall, however, offer what I hope is useful guidance on how to plan for teaching, create an effective learning environment, and assess and report on learning.

As Daniel Willingham has noted (2012), at the current juncture we know more about learning processes in individuals than we do about learning in classrooms, where the presence of a number of children creates dynamics and challenges that are very different to teaching one on one. The key craft knowledge involved in productively managing a classroom is largely still developed through the process of actually doing the work of teaching – and this is the real research gap in education, should you be looking for a topic for your doctorate.

Throughout the book my approach is evidence-based – that is, I draw on the best and most up-to-date, relevant findings from scientific research. I have left out anything that does not have the support of science, no matter how popular, and have been fearless in challenging even commonly accepted beliefs where these have been shown to be in error.

Why another textbook?

There is no shortage of textbooks for educating pre-service teachers. My experience of using several of these and being familiar with many others convinced me that there is room for one more. In writing this book, I have aimed to address the inadequacies that I have encountered in other texts on the subject.

Textbooks tend to follow the template used by their predecessors: what has always been included appears in the next iteration, and the content generally only varies to the extent that more recent research publications are cited. Older ideas that are routinely included may have been proven incorrect by years of research, but their inclusion in textbooks continues to promote them as reputable and worthwhile. The consequence is that current beliefs about the best way to teach are heavily influenced by out-of-date ideas that actually impede teaching and learning.

In addition to the ghosts of the early 20th century that still haunt teacher education, other spectres distract us from what is best classroom practice. Education has become a market, and not only in the sense that schools are encouraged to see themselves as competing for students and adopt practices learned from business. Schools are now seen as providing a lucrative market to those with something to sell. A breathtaking array of products and services are on offer to educators who are encouraged to purchase texts, programs, resources and professional development

sessions that will help their students learn better and do better. Not uncommonly the products are being urged on schools by education departments and administrators who have been convinced of their efficacy, despite reputable scientific evidence that they are ineffective.

From the content of current textbooks it seems that few pre-service teachers are exposed to alternative views about the findings of researchers from the early 20th century or the claims of those with products to sell. The chief purpose of this book is to offer some alternative views, and in doing so to introduce the best in recent thinking about teaching and learning.

Why do people believe things?

You will have noticed that I am calling on the authority of science to support the purposes of this book. I'm not alone of course. This is supposedly the age of science, and everyone – or nearly everyone – uses science to support their claims and positions. 'Research shows' is a pretty common inclusion in the promotion of any idea or product. The purposes of education also include helping our students to think like scientists. But do we ourselves think like scientists?

People's beliefs and attitudes have two main origins: their own experience (that is, the evidence of their senses); and what other people have told them. Both of these sources of information present problems for anyone who really wants to understand the world and how it works.

Take the evidence of your senses. There is no doubt that our senses are superbly attuned to keeping us well-informed about events in our immediate environment – very handy for (historically) avoiding sabretooth tigers or (currently) staying out of the way of speeding traffic. Our perception is not foolproof, however, and we sometimes miss things that are there or think we see things that aren't. For understanding more complex phenomena we certainly need something beyond perceptual evidence.

If we rely on our own experience, then the sun plainly circles the earth. As we now know, that isn't the case, and that is where science comes in. Science can be seen as a set of tools that helps us to overcome the limitations of our senses: microscopes help us to see things that are too small for the naked eye; telescopes reveal objects that are too far away to be seen unassisted; and other tools (such as X-rays, radio waves and microwaves) allow us to access information from sources for which we lack the necessary sense organs. Devices designed to harness the information contained in these 'extrasensory' sources have revolutionised our understanding of the world.

The limitations of our senses are one very good reason why we also seek and obtain information from other people. We harness the powers of observation of the whole species, particularly where this tells us about things we are yet to experience. It is our capacity to learn from each other that has been a major engine of cultural evolution. To have to reinvent the wheel every generation would have had our species

going in circles (pardon the pun). Learning from others, as with trusting our senses, also comes with limitations, however.

When deciding on the reliability of information offered by another person, we tend to use the same test as we apply to ourselves: we trust testimony from someone who claims personal experience much more than we accept information from more distant sources. This can mean that you will accept an acquaintance's estimation of the reliability of a particular model of car based on his or her having owned one, even where this is contradicted by statistics on the general performance of the model. 'Uncle Benny had a mojo-mobile and it was a complete lemon' often carries more weight in the decision about what car to buy than the industry statistics that show that the mojo-mobile is a superior brand of car. As a pre-service teacher, predictably you will be prone to regard the advice of a practising teacher as more reliable than advice from those who do not seem to have immediate personal experience of the classroom. I am hoping that the perspectives offered in this book will give you the confidence to question ideas that everyone else seems to accept.

Cognitive bias

The human cognitive system is also characterised by the sort of quirks that make our perceptual system not always a reliable guide to the world. Our thinking is characterised by a number of what cognitive psychologists call 'biases'. These make us liable to misinterpret information in predictable ways. Of most significance here is what is known as the 'confirmatory bias'.

The confirmatory bias predisposes us to more easily notice information that confirms what we already think. This is where the evidence of our senses and what we have been told by trustworthy others can intersect to make it hard to see what is in front of us. If we have been told by an experienced teacher that a particular way of teaching is highly effective, we are likely to notice any evidence that this is the case over evidence to the contrary. We will also interpret anything we do see through the lens of our beliefs, even where there are alternative and maybe better explanations for what we have seen. This is even more so where we have invested a lot of work into teaching in a particular way. Nobody likes to be wrong or to feel that they have wasted time and effort. The confirmatory bias can come to our 'rescue' by allowing us to see only positive outcomes from our choices.

That the opinion of others can even override the evidence of our senses is not a new observation. The fable of the emperor's new clothes illustrates it nicely. Even when the emperor is plainly naked, the impulse to ignore what is obvious and agree with our fellows is almost irresistible. Social psychology has demonstrated experimentally the truth of the fable's message: that it is hard to disagree with those around us, even if it means that we have to pretend not to see what is right in front of our noses.

Recognising that the techniques or methods we have chosen are not particularly effective is also made harder because we do not have access to large banks of data about the outcomes of the favoured techniques compared to the available alternatives. We can't reteach a topic to a class using a different technique and compare the outcomes. This is where science comes in again, because the tools available to psychology and other human sciences allow for the objective appraisal of beliefs about how children grow and learn or what works best in the classroom, by examining these beliefs in depth in different contexts. Unfortunately these results will not always gain traction if they contradict what people think they know, a bit like relying on Uncle Benny's experience with his car rather than the road safety statistics.

Another source of difficulties for those who would understand teaching and learning better can be traced to something first described by John Maynard Keynes in the context of a different academic discipline – economics. To paraphrase, Keynes observed that what passes for 'common sense' these days is very often the lingering shadow of some disproven academic theory or other. This is certainly the case when it comes to our beliefs about children and their development and learning.

Parents are of course very anxious to raise their children in the best way that they can. For about a century, this being the age of science, parents have been influenced by so-called scientific findings about children. There have been plenty of people happy to cater to parents' thirst for information by writing parenting manuals and guides. The contents of these have usually drawn heavily on whatever was academically reputable at the time. Parents have thus been treated to advice ranging from depth psychology – whose most famous proponent was Sigmund Freud – to behaviourism and the theories of Piaget.

Once these academic ideas about how children grow are in general circulation they can be very hard to dispute. Instead, when teaching students first encounter the theories on which these ideas are based they are ecstatic: here is the scientific proof of what they knew all along. The notions then come full circle: they shape commonsense models of human development; and when they are encountered in the context of a course of study they are taken as proof of what are in effect their own popularised echoes.

The science of infant feeding

Chapter 1 gives examples of how the ghosts of discredited psychological theories still haunt teaching; but another example of science gone wrong provides a useful illustration of the harm done to society when incorrect scientific theories escape the laboratory and influence cultural beliefs. The faith in science and human ingenuity that characterised the late 19th and early 20th centuries licensed the belief that anything 'nature' could do, science could do better. A particularly salient example of this is the search for a better, more 'scientific' food for human infants.

Introduction

From about 1867, various artificial formulae were created and promoted as superior infant foods (Stevens, Patrick & Pickler, 2009). There were of course plenty of businesses that were happy to come on board and manufacture infant formulae to sell to mothers. Maternal health specialists were also confident that these new scientifically developed foods were better for babies, and encouraged their use. Mothers also sometimes accepted bottle feeding as more 'modern', in contrast to 'old-fashioned' breastfeeding. Combined with the influence of popularised versions of behaviourist psychology that promoted the 'necessity' to put infants on a strict feeding schedule, emphasis on the desirability of using infant formula created a problem that hadn't existed before in any widespread sense: difficulty with breastfeeding.

While there have probably always been women who didn't enjoy breastfeeding, and while privileged women frequently farmed out the job to wet nurses, if most women had been unable to feed their infants then the human species would not have lasted very long. Medical 'meddling' in the process disrupted something that the evidence suggests had been uneventfully successful for millennia. These very same iatrogenic[1] difficulties were then taken as proof that breastfeeding was somehow problematic and bottle feeding the better option.

As more research has been conducted on the composition of breast milk, however, the discovery that various infant formulae are lacking in some essential nutrient or other has been a regular occurrence. As each missing nutrient is discovered, it or an equivalent is added to the formula; but soon enough another missing nutrient is revealed. Increasingly breastfeeding has been recognised as good for babies and mothers, leading to policy changes (such as the Australian National Breastfeeding Strategy, 2010–15) designed to promote it (Australian Department of Health, n.d.).

Despite the fact that, for some time now, new mothers have been advised by health professionals that 'breast is best', the message has been hard to promote. In this as everything else, people are more likely to accept the personal testimony of other people they know and trust – in this case usually a woman's mother and other older female relatives. That the attitudes held by these relatives were shaped by campaigns against breastfeeding and influenced by their experiences of iatrogenic

[1] 'Iatrogenic' means medically caused. One way in which 20th-century medical practices prior to the 1960s made it difficult for mothers to breastfeed was the frequent use of anaesthetic for the birth, and the separation of babies from their mothers immediately after birth. Drugs given to the mother during labour crossed the placenta and entered the baby's body. After delivery, the drugged and drowsy baby was removed to a nursery. If the birth was difficult, it was often some days before mothers saw their babies again, by which time their body had sensibly decided that the baby had not survived and shut down milk production. In my case my mother herself decided that I had indeed died, as she did not see me for three days after I was born. Fortunately such medical cruelty is no longer practised. Even if babies were brought to the mothers to be fed fairly soon after birth, this was generally at the medically approved four-hour intervals – again problematic for establishing breastfeeding, especially for mothers and babies affected by anaesthetic drugs. Such practices have been recognised as a source of difficulties since the 1970s and are not often encountered any more.

breastfeeding failure means that the advice they often offer is that bottle feeding is a more reliable option. That medical advice says otherwise can have comparatively little influence, shaped as it by impersonal scientific research. As a consequence, figures reveal that despite strong efforts to promote breastfeeding, the 92% of newborn Australian babies who are breastfed drops to 80% at one week old and continues to decline thereafter (Australian Department of Health, n.d.).

The place of values

Science is a major source of legitimacy in our culture; but there is another concept that is often used to support claims, ideas and courses of action. Perhaps paradoxically, it is the basis for both questioning the wisdom of feeding babies artificial, commercially prepared food instead of human milk and for the fact that some of the discredited scientific models of human development and learning still hold sway in schools and universities. The concept is Nature.

The idea that Nature is superior to the artificial or human-created had its origins in the movement called Romanticism. Romanticism developed in the 18th century as a reaction against the Enlightenment, which was the driving force behind the development of science. For the Romantics – who included artists, poets, novelists and philosophers – science had destroyed wonder and made the world a dreary, mechanical place. Its offspring, technology, was ruining the natural beauty of the world as mines, factories and ugly industrial towns encroached on the previously pristine countryside. It isn't hard still to hear the echoes of Romantic ideas in much that is written today.

An important aspect of how Nature was conceptualised was that everything has both an authentic inner identity and a natural path of development to the fulfilment of that identity, which is followed unless corrupted in some way. Any writer or thinker who talks about 'unfolding of inner potential' or similar related ideas is calling upon the concept of the natural to add weight to his or her words. These sorts of appeals automatically tap into our deep cultural belief in the superiority of Nature and thus make us more receptive to the argument or promotion being presented.

Breastfeeding was promoted by many because it was the natural option, and this argument has perhaps been even more persuasive than the scientifically derived findings that it offers health benefits for mother and baby. The subsequently disproven psychological theories about human learning and development that continue to influence how teaching is thought and talked about are those that appear to be based on the authentic nature of the child. Just as the Romantics saw science as meddling with Nature with undesirable consequences, anything that interferes with children's 'natural' development is portrayed as harmful and ineffective.

The ultimate expression of belief in the superiority of Nature is the contention that the most natural and thus appropriate teaching is no teaching at all. 'Natural' learning

is supposed to happen via a child's exploration of the world. Direct teaching of anything goes against this natural learning. The enduring appeal of inquiry-based methods, despite the evidence against their effectiveness, is largely due to their links to supposedly natural learning (see Shafto, Goodman and Frank, 2012, for a recent discussion of learning and what is 'natural'). However, as Willingham observes (2013, n.p.):

> … when a more knowledgeable person not only provides information but *tunes* the communication to the knowledge of the learner, that is, in an important sense, teaching.
>
> So whatever value you attach to 'naturalness', bear in mind that much of what children learn in their early years of life may not be the product of unaided exploration of their environment, but may instead be the consequence of teaching. Teaching might be considered a quite natural state of affairs.

Many marketeers of both educational and other products like to have a bet each way when it comes to science versus Nature or, more correctly, attempt to trigger associations with both of our chief cultural sources of authority. For instance, shampoo is described as having a scientifically proven 'formula' (that word again) containing ingredients with very 'sciencey' names like Pro-enzyme Z; but they also claim to contain natural ingredients, such as fruit and flowers. The implication is also frequently made that the use of the product will somehow 'unlock your hair's natural loveliness'. In a similar fashion, claims made about educational products (and 'products' is the correct word because they are things designed to be sold) summon up both science and Nature in their marketing. Claims will be made about the research (science) basis of the product while it also promises to 'unlock children's potential' (Nature).

The message from this discussion is not that science or Nature are to be rejected, but that we need to be very aware of the attempts that are often made to short-circuit our critical faculties by appealing to either or both of these concepts in the marketing of products.

The book

This book explores these ideas in more depth, and introduces important research that supports the making of good teaching decisions.

Chapter 1 introduces some of the debates that have shaped education, about what it is for and how it should be conducted. The theories of Egan and Labaree on the purposes of education are discussed. The ideas of Piaget are briefly explored and the evidence for preferring those of his rival, Vygotsky, is examined.

Chapter 2 discusses the cultural context of schooling using Mary Douglas's theory as the lens. The theory highlights that our culture is highly competitive and individualistic, and the chapter examines the implications of this for beliefs about education and how it should be organised. Competitive individualism also has profound effects on beliefs about teaching and the naturalness and desirability of having classrooms mimic life, by catering to individuals and promoting competition. Research into the consequences of these beliefs is described.

Introduction

Chapter 3 explores the idea of 'natural pedagogy' and expands on Vygotsky's work and that of his followers, including Barbara Rogoff. The cultural nature of human cognition is discussed and the concept of the 'cognitive tool' is introduced. The profound reciprocal influence between schooling and culture is also discussed.

Chapter 4 introduces research into human intelligence, tracking the history of the development of IQ tests and how this influenced cultural beliefs about the nature of intelligence. The chapter discusses the phenomenon of the Flynn effect and how this provides evidence for conceptualising intelligence as a cognitive tool in the Vygotskian sense.

Chapters 5 and 6 explore memory – the underpinning for learning. The research that has been done on memory processes and structures is discussed, and conclusions are drawn about the light this research casts on exactly what is measured by intelligence tests and why these tests predict success at school. An understanding of how memory works leads to recommendations for effective teaching strategies and techniques. Ways to help students to understand and use their memories effectively are outlined.

Chapter 7 introduces important non-cognitive (that is, non-IQ) factors in school success. Carol Dweck's theory of mindsets is discussed. The importance for success of cultivating characteristics such as grit and persistence is emphasised. 'Stereotype threat' as a factor in under-performance by stigmatised groups is also featured.

Chapter 8 examines the research into the development of expertise and what this reveals about both children's learning and the professional development of teachers. What to expect from your students and yourself as you move from novice to expert is outlined.

In Chapter 9 the social aspects of teaching are introduced, starting with the social psychology of the classroom – knowledge that can help you to establish and maintain pleasant and productive relations with your classes. That most powerful of all cognitive tools, language, and how to use talk effectively for teaching, forms the second part of the chapter.

Chapter 10 explores the powerful tools of assessment and feedback, including the different purposes for which assessment is used. The chapter outlines how to maximise learning by employing effective feedback.