LEARNING TEACHING

BECOMING AN INSPIRATIONAL TEACHER

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Contents

Chapter 4   Abstract versus concrete

This chapter is about

- **engaging with the 'big' ideas that underpin lessons and learning;**
- **developing 'meta-learning' and 'metacognition' in the classroom;**
- **the knowledge teachers need, including pedagogy and curriculum subject content.**

Introduction

Abstract versus concrete? Don't good teachers and good writers back up their explanations by using concrete examples to illustrate more abstract concepts? Surely learners need some basic factual knowledge in order to solve problems? When does 'abstract' prove to be better for learning that being more down to earth and 'concrete'?

We consider that highlighting the dilemma 'abstract versus concrete' helps teachers to avoid too much focus on the detailed subject 'content' of a lesson or sequence of lessons. We are not denying the importance of content, but rather suggesting that by starting to plan with a focus on the concrete, it is possible to lose track of the key concepts, the more abstract big ideas within the curriculum subject discipline that underpin the lesson or activity.

Learners need to approach and engage with an abstract concept through practical problem-solving activity. However, a key challenge for the teacher is to ensure that coverage of content does not become the sole purpose of the lesson. After all, Howard Gardner (1991) memorably warns us that coverage is the enemy of understanding. Equally, we would warn against approaches that over-emphasise 'learning to learn' in the absence of meaningful content knowledge. The teacher's role is to orchestrate a balance between engagement with

a key concept within a curriculum subject and the development of thinking dispositions. The teacher then asks our key question: 'What is my impact on learning and on learners?'

In this chapter we focus on the learning power of 'meta-learning' (focusing on the key concepts within a curriculum subject discipline) and of 'metacognition' (reflecting on the process of learning). In relation to teachers' workplace learning we focus on what 'knowledge' or 'knowing' teachers need, for example, to be able to plan sequences of powerful learning activities. In this chapter we will argue that 'abstract beats concrete', meaning that as a teacher you need to facilitate meta-learning for your learners and you need to plan learning activities in relation to the relevant key concepts within curriculum subjects.

CLASSROOM SCENARIO

David's geography lesson

We had been studying our topic for three weeks: the Vikings and their settlement across large areas of Britain around a thousand years ago. My class was full of enthusiasm after our whole-school day trip to visit a Viking museum. I had planned to capitalise on the experience of the trip by moving on, in the following week, to a whole-class role-play activity. There were loads of ideas on the web about Viking role-play lessons, and I borrowed and adapted them to design a challenging activity that would involve an element of cross-curricular, creative learning.

My initial idea was that we would think about why the Viking settlers chose the sites they did to build their villages. When I say this was my idea, what I mean is that this was my interpretation of a classic lesson that has been developed and adapted by geography teachers over the years to suit their purpose and local context. I divided the class of 30 into six different specialist groups, to represent the opinions of woodcutters, water carriers, farmers, soldiers and thatchers (who need reeds to build and repair thatched roofs). I provided a simplified map of the area and each group had to debate where they would want to build their settlement and why, according to the varied needs of the villagers. I then reorganised the class into final decision-making community groups. These new groupings each had one woodcutter, one water carrier, one farmer and so on. As intended, this led to huge debates as each community group had to resolve different opinions and reach a decision on where they would build their settlement. The debate centred on the different needs of being close to forest, a water source, land for growing crops and grazing animals, an easily defended position and a marshland where reeds for thatching could be harvested. High-achieving children within the class were given an additional challenge in relation to 'chairing' a group discussion, and prompt cards for each role supported the expectation that all learners would contribute to the discussions. Each group had to present their proposal to the rest of the class and we would vote. I got swept up in the idea, and so did the class.

My headteacher asks teachers to submit half-termly plans showing intended learning outcomes, a basic structure for each lesson, resources and cross-curricular links. When it came to filling out that box for cross-curricular links it seemed obvious that this would be a spoken language activity, which was useful because I hadn't recorded an assessment for that area of learning for a while. I also thought we could measure distances from the sites chosen for the settlement to other locations, for example, to the river for water and the forest for firewood, and that would contribute to our work in mathematics. My main intended learning outcome for the session was: 'We will begin to understand why the Vikings built their settlement in that particular place.'

The children loved the lesson, and I got a real buzz from it. Each group was totally on task, thinking of their own reasons for choosing a particular location, and the bit when each group presented was fantastic; I thought their arguments showed real understanding of their knowledge of the Vikings. I went home feeling pretty good about it all, but then two things happened that have knocked my confidence in the value of the lesson.

On my way to school the next day, I popped into the local shop to pick up a sandwich for lunch. The mum of one of the boys in my class served me. They're building a new enormous supermarket just over the road from school and there's a campaign for people to keep using the little local shops, so I try to support it when I can, as it's quite a tight-knit community around the school. At first I was delighted she mentioned the lesson and how much he'd enjoyed it, but as I walked out of the shop, I replayed her words in my head 'George is loving your lessons on the Vikings, he didn't shut up yesterday about how much he enjoyed being a Viking farmer.' This niggled at me a bit, but I wasn't exactly sure why. Then, after I'd done the register and we were moving on to writing up an account of the previous day's lesson, I asked my usual question, 'What did we learn about in yesterday's lesson?' Most of the hands went up, I asked five people and got five versions of the same sort of response: 'We learnt about the Vikings', or if pushed, 'We learnt about why the Vikings built their village on the hill above the river.' I asked them to think about it again, talk to a partner and think if there was anything else that they learnt, and I got a few more tentative responses: 'We learnt about how far it was from the river to the village'; 'We learnt about how the Vikings might have spoken to each other.'

Their enthusiasm was still undimmed, and we went ahead with the writing exercise. But I went home that day feeling less pleased with myself. Yes, they had learnt even more about the Vikings and their villages. But was this really the point of my lesson? I no longer felt so sure. As I left the school entrance I carefully drove my car around the road works caused by the building of the main entrance to the new superstore. It occurred to me that it was a silly place to put a superstore. I thought about the corner shop run by my student's family and realised they must be worried about the effect on their business, and I wondered if the lesson was really about where things get built and who decides. Or maybe the lesson was about how communities and groups of people work together or against each other, how tensions are resolved in human interaction. Above all, I was worried that the children saw absolutely no connection whatsoever between the 'then' of the lesson and the 'now' of their lives.

Questions about David's lesson

1.   What was this lesson about? What was David really trying to teach in this lesson? What was it the children were supposed to be able to do or understand?

2.   What did the children seem to make of the lesson? In what way is the issue of the new supermarket relevant to the lesson?

3.   What steps could the teacher take if they were teaching this lesson again, to engage learners with the big ideas underpinning the lesson?

4.   What are the implications of this case for the way teachers engage with national curriculum documents and develop school-level schemes of work as well as individual lessons?

5.   What are the implications of this case for your approach to developing your own subject-discipline knowledge as a teacher?

LEARNING POWER

The learning power of going 'meta'

Ask a learner what sort of thinking they needed to do to solve a problem and you've asked them to engage in metacognition. Metacognition can be defined as thinking about thinking (or 'knowing about knowing'), and therefore involves a regulative element – getting 'above' or 'beyond' the activity to reflect on the thinking process itself and how one can do that more effectively. Similarly, metacognition's close cousin meta-learning involves learning about learning. Both processes can be elicited when you ask children questions like 'What kind of thinking are you doing here?', 'Have you done anything like this before?' and 'Why do you think this task is so hard?'

Meta-learning and metacognition are deeply connected to both the content and the processes of learning. So a good deal of learning to learn operates within curriculum subject disciplines and involves the learner's engagement with key concepts, the 'big ideas' within the subject content that underpin learning activities, case studies and examples introduced by the teacher or discovered by the inquiring learner. Meta-learning therefore includes learners' engagement with epistemology, the 'ways of knowing' within specific curriculum subject disciplines. Getting to grips with these ways of knowing helps a learner to 'become' a mathematician, a historian, a geographer and so on. For example, understanding a scientific method through the design of an experiment is fundamental to becoming a scientist.

Both metacognition and meta-learning are high-order skills which enable the learner actively to monitor and regulate their progress, as well described by the actor Tobey Maguire (Spider-Man!): 'I'm self-aware enough to understand that it's statistically very hard to achieve the

position I'm in, but … I find the way, like water; I like to be productive. I'm constantly reflecting on personal progress. I got those ideas aged 15, and they've been north stars to me' (Tobey Maguire, 'I Always Knew I'd Be Successful', *Guardian*, 11 May 2013). It is interesting that Tobey can locate so specifically the time he discovered the power of going meta – could there have been an inspirational teacher involved?

This book represents an invitation to meta-learning in the professional field of teaching, but we made a particular feature of this in the learning power section of Chapter 1 when we asked you to reflect on your understanding of two contrasting metaphors for learning – learning as *acquisition* and learning as *construction*. When you are asked to get above the concrete particulars (of a lesson plan, for instance) into the heady, higher-order altitude of abstraction (what type of learning might be happening here?), certain demands are made and they're not always comfortable. But they are essential at the top end of learning, both for teachers and their learners.

When researchers examine vast numbers of studies of the most powerful influences on academic achievement (known as 'meta-reviews' of research), there is one consistent finding: regular engagement in robust metacognitive and meta-learning activities raises the achievement of learners. One such researcher, Robert Marzano, describes metacognition as the 'engine' of learning. In a range of different approaches used internationally, metacognition and meta-learning are often described in such terms as 'self-regulation' or 'deep reflection'. Little wonder that one of these researchers, John Hattie, insists that the teacher's job is not to make learning easy – it's to make it difficult. It's in these difficult-to-reach territories that learners are forced to stretch beyond their existing skills and knowledge in order to construct links and conduits to new skills and new knowledge. This is at the heart of constructivist learning – using existing knowledge to (co)construct new knowledge with the aid of a skilled facilitator of learning – asking the right questions, probing for inconsistencies and exceptions and challenging thinking. In the poet Robert Browning's memorable expression, we should allow our reach to exceed our grasp, or what's a heaven for?

Evidence for going meta

Let's explore some of the evidence base for the power of abstraction, as revealed by the great synthesisers of research studies:

- There is strong evidence from research meta-reviews on the impact of regularly getting learners to identify similarities and differences – mental operations which require the learner to 'get above' the concrete particulars to see the ways in which two or more elements are alike or different (Marzano et al, 2001). This example of meta-learning has claimed effect sizes from 0.88 to 1.76 – equivalent to shifting a learner's performance from 50 per cent to 81 per cent or more.

- The learning power of metacognitive strategies for supporting learners to get 'above' the content in order to engage with abstract conceptual principles is claimed by Margaret Wang (Wang, Haertal and Walberg, 1993). A more recent research meta-

review has found such metacognitive strategies to lead to achievement gains of eight-plus months (*d* = 0.67) and that this approach represents *high impact at low cost* (Higgins et al, 2011).

•   In another meta-review, significant metacognitive elements, often in the form of self-regulation processes, were one of the highest-ranking influences on raising achievement (Hattie, 2009). In addition, Hattie cites research suggesting that 'When tasks are very complex for the learner, the quality of metacognitive skills rather than intellectual ability is the main determinant of learning outcomes.' This is because in conditions of high challenge, learners can't rely on their existing data-sets of skills and knowledge – they must improvise, and improvisation encourages learners to exercise higher-order skills, to think about their thinking.

Implicit in Hattie's observation about complex tasks is the call to ensure a healthy diet of challenging tasks for every learner. Only in the *absence* of challenge and complexity does intellectual ability become a strong determinant of learning outcomes. So if you do find a close correlation between your learners' cognitive test scores and their learning outcomes and a weak correlation between their metacognitive skills and their learning outcomes, be just a little concerned: this might point more to an impoverished learning environment than to the predictive power of intellectual ability.

In a newspaper article the sports psychologist Kerry Spackman provided a high-profile example of metacognitive skills trumping ability in situations of high challenge. Explaining the reasons for the Formula 1 star Lewis Hamilton's success he responded to the suggestion that Hamilton was simply born with the ability to go fast by arguing, "What he has is what Schumacher had – a structure and a process for how to learn and improve. Every experience is a learning experience. It wasn't a load of random things happening to him. Lewis is the same – he obviously has talent, but he's a vastly superior driver now because he's learnt how to learn, which most drivers don't do. Every experience has a way of being analysed, understood and filed away. He doesn't just pound around a race-track repeating the same old habits"' ('The Brain Rewiring and Supercharging That Makes Hamilton a Master', *Guardian*, 26 May 2007). Spackman is arguing that Hamilton did not merely learn about aspects of racing cars, he also learned to learn. So rather than learning, for example, about how to manage the wear and tear on his tyres during a race, Hamilton learned how to learn about managing the tyres and kept right on learning.

Note how this issue around high-challenge tasks sits uneasily with the dominant 'acquisition' vision of learning, which aspires to the mechanical simplicity of efficient knowledge transfer, and a possible explanation for the high status that 'ability', streaming and setting are given in this vision.

As a teacher you might initially consider the underpinning key concept behind every lesson you plan: this is a much better starting point than mere content or learning activities that have 'worked' before. Having identified the key concept(s) that learners will engage with during the lesson, you will begin to identify possible learning activities and detailed content, but

always with an eye on your aims in relation to the impact both on learning and on learners. You will need to consider what issues the learners will explore, what questions they will ask, what skills and dispositions they may develop and how you will allow them a degree of autonomy in the way that they tackle the tasks.

Getting 'above' the concrete

To move from the meta-review of research data to one practical instance of the power of abstraction – getting 'above' the concrete particulars – consider an adaptation of a study first conducted in the 1940s (Duncker, 1945). Two later researchers (Gick and Holyoak, 1980, p 307) drew on the initial idea in their own experiment and in so doing demonstrated the power of analogy:

> *Suppose you are a doctor faced with a patient who has a malignant tumour in his stomach. It is impossible to operate on the patient, but unless the tumour is destroyed the patient will die. There is a kind of ray that can be used to destroy the tumour. But if the rays reach the tumour all at once and at sufficiently high intensity, the healthy tissue that the rays pass through on the way to the tumour will also be destroyed. At lower intensities the rays are harmless to both healthy tissue and the tumour. What type of procedure might be used to destroy the tumour with the rays and, at the same time, avoid destroying the healthy tissue?*

Only 10 per cent of people solved this problem. When this problem was followed by another story, however, the success rate rocketed to 90 per cent (based on Gick and Holyoak, 1980, p 309). See if you can figure out why:

> *A small country was ruled from a strong fortress by a dictator. The fortress was situated in the middle of the country, surrounded by farms and villages. Many roads led to the fortress through the countryside. A rebel general vowed to capture the fortress. He knew that an attack by his entire army would be sufficient to capture the fortress, so he gathered his army at the head of one of the roads, ready to launch a full-scale attack. However, the general then learned that the dictator had planted mines on each of the approach roads. They were set so that small bodies of soldiers could pass over them safely, as the dictator himself needed to transfer his troops and workers to and from the fortress. A larger force, however, would detonate the mines. It seemed impossible to capture the fortress, until the general hatched a plan: he divided his army into small groups and dispatched each group to the head of a different road. At an appointed signal, each group marched down a different road to the fortress, arriving at the same time, and capturing the fortress.*

What seems to happen is that once the clear connections are made between the second story and the first intractable problem, the solution becomes obvious. The story had its own solution embedded within it, of course, and we needed simply to abstract the core idea (attacking the 'enemy' from multiple directions, each direction being of low strength but collectively amounting to great strength) and transport it into the initial problem. This skill of analogy, importing ideas from one domain into another, perhaps wildly different domain,

is excited by the opportunity to think metacognitively – what is the big idea here? Can we borrow something from one area that might be useful in another? Can we make useful *connections*? Classroom implication: encourage learners to identify central characteristics and thereby to get 'above' the material from an analogous perspective.
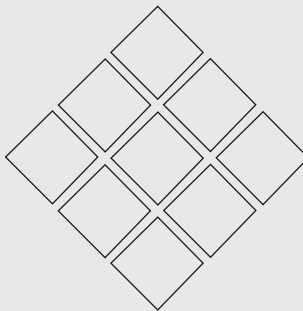
Moving beyond learning to learn within curriculum subject disciplines, Howard Gardner identified the power of connection-making in a short interview in *The Psychologist* magazine in October 2003: 'Interdisciplinary thinkers are able to draw on a variety of methods and concepts in order to approach and solve problems that cannot adequately be resolved through traditional practices drawn from a single discipline.' As a teacher, you will do well to encourage the skills of connection-making in your learners. Some learners will seem to do this of their own accord, like Alice Bell, Science Policy Research Unit Research Fellow at the University of Sussex: 'I finished A levels barely bothering with formal chemistry exams but boasting a final fine art piece inspired by hydrogen bonding, English lit coursework exploring fictionalised physics, and having studied a history syllabus largely devoted to nuclear proliferation. I've hardly looked back since' (Bell, 2013).

But all learners will benefit from your explicit and regular invitations to go 'meta'. This account from a secondary English teacher, Chris Reck, was given to one of the authors some years ago:

> *Hi Barry – Just to let you know that I have started using some of the thinking strategies you recommended, and they have been particularly successful, for instance cross-curricular links relating learning from previous lessons to learning objectives. I remember you said that the idea behind this was to demonstrate how to make connections – ie the teacher demonstrating the thinking process. Here's an interesting one. I am teaching Of Mice and Men as a different cultures text. In particular we are examining the idea of the American Dream. I asked my class to tell me what their previous lesson was and their learning. Half had come from Food/Tech and half from Design/Tech. The learning? You can only freeze food if it is below 5 degrees C, the conditions that cause metal to rust, and how to make a kebab. Connections to the American Dream? Well, Lennie and George want to have a place of their own so they have the freedom to choose who they can invite round and share what they have produced from 'the fatta the land' – could well be a kebab that they'd kept frozen. Metal rusts? Rust is a form of corruption/death: an interesting metaphor for the erosion of our dreams. This was particularly powerful. By the time we had read Chapter 4 we were able to discuss the 'rusted dreams' of several of the characters. Another example was a group who had been studying the rise of Hitler in History earlier that day. They themselves made the connection to the American dream – Hitler persecuted the Jews, homosexuals etc. in order to realize his vision of the perfect society. Only connect!*

Chris was a fairly newly qualified teacher at the time, but he went on to become an exceptional Advanced Skills practitioner who regularly invited his learners to make abstract connections, creating an extensive set of connection-making activities for this purpose.

The metacognitive domain isn't the preserve of secondary teachers, despite some misinterpretation of Piaget's work that certain high-order cognitive functions must necessarily await the teenage years. From the early years onwards, you can get children to make connections between apparently unrelated objects ('How is this the same as this? How are they different?'), to compare, to contrast, to classify, to make and to deconstruct analogies and metaphors, to become proficient in and to exercise strategic judgement in the use of graphic organisers like comparison matrices ('Compare and Contrast'), Plus Minus Interesting (PMI) matrices, Venn diagrams, Diamond 9 ranking rubrics, thinking maps and the like. These are all different ways of providing a visual scaffold to material. For instance, Diamond 9 rankings require the learner to rank nine elements from most to least important:

We close this section of the chapter by inviting you to make connections with the previous chapter. There we cited Berlin's conception of 'freedom to' being underpinned by a consciousness 'of myself as a thinking, willing, active being, bearing responsibility for my choices and able to explain them by references to my own ideas and purposes' (Berlin, 1969, p 131). Demand for yourself and for your learners the right to exercise agency over your life and learning and theirs. Take responsibility for your choices and get them to take responsibility for theirs. And to explain them – go meta.

Things to try

» *Search online for a clip of the comedian Father Guido Sarducci's 'Five Minute University' and reflect on what this has to say about the balance between the concrete and the abstract in contemporary education!*

» *Introduce the concept of 'going meta' to your class, and use the term as often as possible. Seek out opportunities for the class to 'get above' the concrete particulars of a lesson to the guiding principles by asking questions with a meta-dimension: What's the big idea in this question? What type of question is this? Have you done anything like this before? What's the tough bit in this task and why is it tough?*

» *Invite your class to ask meta-questions and write these up on the board/flip chart as they emerge, acknowledging their value and significance.*

» *Consider a lesson you are currently planning. Work on your intended learning outcomes for the lesson. Ask yourself about the underpinning concept(s) of the lesson and consider how your learners will demonstrate their increased understanding. Consider key questions and other strategies for making connections between the 'concrete' facts and examples that the learning activities involve and the more 'abstract' bigger picture of the underpinning concept. How will you use explicit strategies for meta-learning?*

» *Similarly, think about the metacognitive aspects of your lesson. Identify thinking dispositions such as curiosity, persistence, creativity, logical thinking, collaboration or independent learning that might be particularly useful to learners in this lesson. Create opportunities within the lesson, even if it is just part of the plenary, for learners to reflect on the process of learning, for example, by considering the question: 'What learner skills have I used and how did they help me to tackle the task?'*

TEACHERS' WORKPLACE LEARNING

Teachers' pedagogical content knowledge

What does an effective teacher need to know? This question has been debated for many years and is still a highly contested issue. A key issue is how the skilful teacher combines knowledge of how to teach (meaning instruction or pedagogy) with knowledge of what to teach, the curriculum subject content (meaning, for example, a key concept or skill in mathematics). If you have studied a traditional subject discipline, at advanced level in school or college and especially as a first degree, then to some extent you will have developed a strand of identity, for example, as a 'historian', 'mathematician' or 'scientist'. Now as a beginning teacher you will be engaging with new knowledge on how to teach, and this pedagogical or instructional theory (sometimes referred to as 'didactics') will have challenged some of your existing 'common-sense' ideas about what makes a good teacher. In Chapter 2 we talked about teacher identity, to what extent you see your identity as first and foremost 'teacher' or first and foremost 'geographer' or 'scientist' or 'mathematician'. You may wish to consider how these are connected, whether your identity is a 'teacher of geography' or a 'teacher of science'. And are you leading your learners to become scientists, geographers, historians …?

If you are a primary class teacher then you may need to develop a wide range of content knowledge across the curriculum subjects, including a confident grasp of literacy and numeracy. If you are a subject specialist teacher you need in-depth content knowledge in your particular subject discipline, but you also need knowledge of literacy and numeracy. There is a real debate about the importance of different kinds of teacher content knowledge. Certainly many people, when fondly recalling their school days, will claim that their own passion for a particular subject was initiated primarily because of the passion of a particular teacher for that subject. A professor of geography at Liverpool University (Andy Plater) secured relatively poor geography O- and A-level grades but went on to achieve eminence

in his field. When asked what had inspired him to study geography at university in the face of mediocre results, he identified two inspirational geography teachers who had faith in him and who revealed to him the excitements and possibilities of geography beyond the formal and examination-bounded curriculum.

From a sociocultural perspective (Blackler, 1995) we would argue that the professional knowledge or 'knowing' of a teacher is usefully seen as having five characteristics:

- teacher knowledge is dynamic – you will be continually learning;
- teacher knowledge is situated – your school context will shape what you learn;
- teacher knowledge is social – you will develop your knowledge within a team;
- teacher knowledge is contested – there is debate on what and how to teach;
- teacher knowledge is mediated – it is shaped by language, rules (including unwritten rules), key ideas and values within your school as a workplace and within society;
- professional knowledge is an element of teacher identity.

So what are the implications of this dynamic, situated, social, contested, mediated and identity perspective on teacher *knowing*?

First, you cannot expect to learn everything you need to know at the start of your teaching career. This applies equally to how to teach and what to teach. Professional standards and teacher training supervisors may at times seem to expect this, but you need to be realistic and not try to be superhuman. You will need to prioritise your learning and accept that you will only gradually develop expertise as a teacher. The key here is to build your inquiry-based teacher learning strategies so that you do continue to develop throughout your career. Consider yourself as a self-regulated learner in relation to becoming an inspirational teacher. Use meta-learning and metacognition strategies to develop your own professional learning.

Second, the complexity of becoming a teacher may at times seem overwhelming and no doubt you will tend to focus on practical wisdom and want to gather 'tips for teachers' that you can immediately try in your classroom. But despite that understandable urgency, you need to remember the 'interplay' metaphor and seek to draw on public knowledge to help to evaluate the learning activities and approaches you gather. Kurt Lewin, the inventor of action research, famously stated that 'there is nothing so practical as a good theory' (1951). You might consider that there is often nothing so invisible as a good theory, meaning that much learning theory becomes common sense and is viewed by teachers as practical wisdom. To draw out this underlying theory you might reflect on the assumptions underpinning the practical tips you are offered by experienced colleagues. Teachers working in other schools or even just departments in the same school are also an important resource to help you to stand back and question the local practice and ways of working in which you are becoming embedded.

Pedagogical content knowledge

Teacher knowing includes knowledge of how to teach (pedagogy) and combines this with knowledge of the curriculum subject content (for example, of science, history or mathematics). As

a teacher, you need to bring together these different areas of knowledge to inform your practice in planning, teaching and assessment. An influential body of work on this process has been completed by Lee Shulman and his colleagues at Stanford University. One key idea was the overlap of areas of knowledge to form the 'pedagogical content knowledge' of a teacher as illustrated in Figure 4.1.
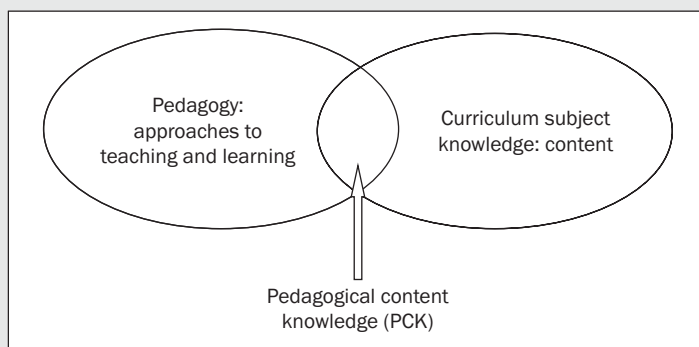

Figure 4.1 *A teacher's pedagogical content knowledge (PCK)*

Within Figure 4.1 the curriculum subject content knowledge means the key ideas, ways of knowing and skills of a subject discipline such as history, science or mathematics. The pedagogy or approaches to teaching and learning means knowledge of how children learn and strategies for planning, inclusion, facilitation and assessment. Where these two overlap represents the idea developed by Lee Shulman of 'pedagogical content knowledge', which is referred to as PCK. Pedagogical content knowledge may be defined as the teacher's understanding of key concepts in the subject discipline and how to teach them effectively, including the most powerful explanations, demonstrations, metaphors and concrete examples to make the key concepts, skills and ways of knowing within the subject discipline accessible for learners (Shulman, 1986). 'Location' is a key concept in geography, illustrated, for example, by the 'least-cost' location in terms of transporting the raw materials to a factory. This idea of 'location' is the key concept or big idea that underpins David's lesson in the scenario at the beginning of this chapter. As a teacher David is perhaps too focused on the detailed content of the lesson, which seems to be about Vikings and settlements, rather than on this key concept of 'location'. Note that two other concepts might also be approached in that lesson. The concept of 'time' is addressed in the sense that the landscape reflects decisions made in the past, and the concept of 'decision-making' is addressed in the sense that location decisions are influenced by environmental, economic, social and political factors.

Implications of PCK

First, whenever you are planning a lesson or sequence of learning, you need to focus initially on key concepts and only then will you need to identify concrete examples, case studies and learning resources. In practice this will often work the other way around, but still you must identify the key concept or big idea underpinning the purpose of the lesson. You need to appreciate that your teaching and professional learning will be strongly situated, meaning

that it will be shaped by ideas, rules and objects that seem commonplace and taken for granted in your school workplace. For example, a 'scheme of work' or the school's idea of 'excellent work' or the resources available for a particular topic will affect your decisions and approaches. Your understanding of a key concept within a curriculum subject will shape your approach to teaching the lesson, but so will the view of how to teach that concept held by your teaching team or mentor teacher. A useful way to focus on pedagogical content knowledge is to step back from the planning or evaluation of a lesson and ask: 'What are the big ideas or key concepts within the subject, underpinning the purpose of this lesson?' This understanding of key concepts within curriculum subjects is not something you are likely to master solely through individual study, although that will be a part of the process. Discussion and collaborative planning of lessons and medium-term schemes with other teachers will be a key opportunity for professional learning.

Second, you should be aware that teachers who are learning new curriculum subject content may have a tendency to resort to teacher-led and content-heavy lessons. This is understandable: there is so much new information and a teacher-led lesson in some ways may seem less risky. While not suggesting that you can afford to be unprepared, we propose that if you are willing to risk using inquiry-based learning for your learners then one benefit is that you can position yourself as a learner and model being a learner within the subject discipline. So in preparing lessons try to focus on your understanding of the big ideas, the key concepts, and derive some key questions related to those, rather than trying to learn all there is to know on the topic. Design learning activities based on a constructivist approach that are active for the learners, making them do the hard work. Consider to what extent you might be able to develop more challenging and open-ended learning activities using learners' current and background knowledge, supplemented by their research using resources such as text books, other learners, the local community and, if available, the internet. Remember the mantra 'no risk, no learning'.

The wider context

Pedagogical content knowledge is not set in stone and does not exist in a vacuum. What is taught in classrooms and how it is taught are heavily influenced by the wider context of schooling, community and educational policy frameworks. For example, in your school what is considered to be the school science subject of 'biology' may be affected by the level of subject expertise within the teaching staff, the geography of the local area and wider region and relevant national curriculum policy or guidance set by regional or national government. The influence of the local community and economic activity is likely to at least influence the choice of case studies used in lessons, for example, related to local types of farming, manufacturing industry or other commercial activity. The regional or national curriculum guidance or wider culture is likely to influence the position of biology as a science subject in its own right, alongside, for example, physics and chemistry, or as a part of a broader concept of combined 'science'. In this way, 'school biology' is different from the wider conception of the subject discipline and has its own characteristics and content. It is therefore helpful to
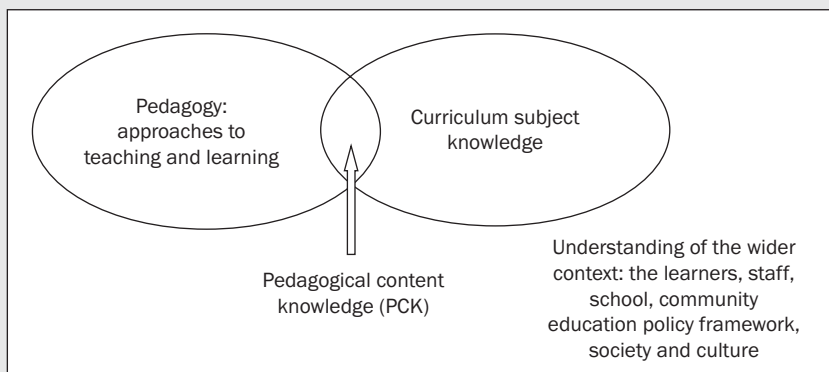
Figure 4.2 A teacher's pedagogical content knowledge within the wider sociocultural context

place Figure 4.1 into a box representing knowledge of the local community and the wider educational policy framework.

By including the wider context, Figure 4.2 acknowledges the power that schools and teachers hold as they mediate the influence of the community and of educational policy. It is important that you maintain a reflective awareness of the beliefs and values that you bring to the role of teacher. For example, local community or national values around diversity issues may sometimes appear to clash with your moral and professional responsibility to support *all* of your learners. Whatever your personal and political beliefs, a teacher has a moral obligation to support all of their learners in an equitable way and to set themselves high professional standards in creating an inclusive classroom and school.

So what are the implications of considering teachers' knowledge within this wider context?

First, and most importantly, you will want to know your learners in order to build effective working relationships with them and to empathise with their experience of schooling. This is an absolute priority and involves practical steps such as:

•   knowing names;

•   greeting learners on arrival at school and at each lesson;

•   meeting and talking to them outside the classroom;

•   checking their records, including learning needs and previous school reports;

•   working with learners in extra-curricular activities.

This priority placed on knowing your learners includes, as far as possible, getting to know their parents and their wider community. You need to be able to empathise with your learners and as far as possible understand their viewpoint on school and education. This reflection on the relational aspect of teaching is developed further in Chapter 6, but before you move on from this paragraph just pause for a moment and imagine yourself as a parent or carer. In terms

of priorities for schooling, knowing that your child is really known and talked to as a unique individual on a day-to-day basis is sure to be high on your priorities, if not at the top of them.

Second, you will be aiming to build links from the wider context into your classroom. This includes illustrating key concepts within the subject discipline by using relevant examples and case studies in lessons that learners will recognise from their local community and economy. It also means giving learners choice and control to select topics for inquiry from the wider world that interest them. You may also be able to bring experts in from the local economy or use visits to engage with local social and economic activities. These approaches force you to engage with and get to know the local community and will help to make you more empathetic and genuine to your learners.

Third, you will try to question regional or national curriculum policy and mediate the way that it is interpreted into schemes of work and lessons for your learners. As a professional you must not simply accept national or regional policy on the school curriculum: that would position you as a technician 'delivering' prescribed schooling. Instead, you must question, interpret and mediate the curriculum to suit your learners within their local context and support them in their wider education.

Fourth, you will not wish to ignore the big picture of your role in developing beliefs and values within the community and wider society. Schooling is a huge intervention by a society into social, cultural and economic development, and it is essential that you question its impact on your learners. Being a teacher is a privileged position in society with considerable autonomy, at least at classroom and school levels, to influence young people. It carries with it big responsibilities in terms of nurturing beliefs and values in children and young people. You will want to continue to read, reflect and think about your impact on learners through shaping their education as members of society and global citizens. You will want to reflect on your own values and behaviours because you will be a role model for children and young people.

Teacher identity and practice

A final amendment to the model of teacher knowing is required. Learning teaching involves 'being' and 'doing' as well as 'knowing'. Your practice and identity as a teacher is part of the mix and overlaps with your knowing of pedagogy and of curriculum subject content. In Figure 4.3 we have added 'identity and practice' in order to acknowledge their importance in shaping the knowing of a teacher (see Chapter 2). This creates an overlapping 'hot spot' where PCK is aligned with teacher identity and practice. We propose this diagram as a model of teacher knowing and argue that this hot spot represents those lessons or teaching moments when 'flow' is achieved so that your practice as a teacher is completely focused on the learning of your learners. These are the moments when your teacher knowing is flowing and you may achieve the status and impact of an inspirational teacher. We introduced flow in Chapter 3 in relation to children's learning, but now we will consider it briefly in relation to your learning as a teacher.
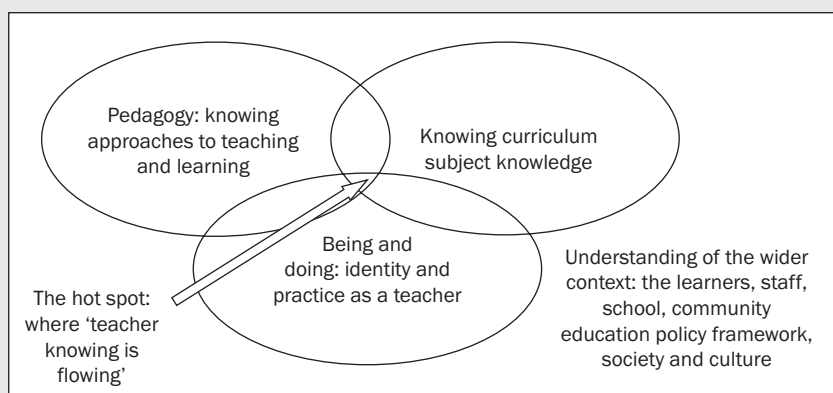
Figure 4.3 *A teacher's knowledge, identity and practice in context – giving the possibility of 'flow'*

The concept of flow, developed by Mihaly Csikszentmihalyi, has most often been applied to sport or other skilled activities such as playing an instrument. Flow is 'the way people describe their state of mind when consciousness is harmoniously ordered, and they want to pursue whatever they are doing for its own sake' (2002, p 6).

It is possible to consider the classroom teacher as comparable to a participant in an extreme sport, such as a rock-climber, because of the unfortunate and potentially dramatic effects of failure in both situations. Teaching, or rock-climbing, at the limit of your ability requires a kind of concentration that is focused rather than stressful, that is calm rather than nervous and that is more akin to a relaxed flow than a concentrated effort. Flow means not self-consciously managing your performance but still operating at a high level near the edge of your current ability. Teacher flow means classroom teaching that is well planned and yet flexibly responsive to children's engagement and learning, that hits the hot spot where different forms of teacher knowing come together and that might seem like hard work but will also be deeply satisfying.

As a beginning teacher, first you need to be realistic – you must not expect to experience 'flow' in your teaching every day. However, you are likely to achieve flow for occasional short periods, and when you do then you should enjoy it, reflect on it and use teacher inquiry tools to consider how you can work towards making it happen more frequently.

Second, it is important that you consider your professional learning as 'interplay' between vertical public knowledge and horizontal practical wisdom as discussed in Chapter 1. Take care not to over-rely on practical wisdom, but equally do not dismiss local ways of working too easily when considering research evidence or policy. Seek to inform your teaching and build pedagogical content knowledge through engagement with public knowledge, including learning theory, research evidence, professional guidance and policy.

Third, whatever formal and informal professional learning activities you engage in, it is important that you embed your new thinking or knowledge through practical activity. You might use

an advanced-level textbook to consolidate your understanding of a key concept within a curriculum subject, you may have the opportunity to observe another teacher or you may attend a professional development workshop. All of these activities are likely to remain isolated and relatively ineffective unless you use some of what you have learned to make a change in your classroom and use inquiry to evaluate its impact. This enactment is an essential element of teacher learning.

Things to try

» *Consider your current professional development targets and what actions you are taking to address them. Consider to what extent these target areas include some focus on developing your curriculum subject knowledge. Make this as practical as possible, draw up a learning 'to do' list. Your list might include issues to explore using books and websites, teaching strategies to explore and experiment with, great teachers you will observe, critical friends you will meet with to debate issues, teacher networks you will join and contribute to. Make sure some of this list is focused on developing your curriculum subject knowledge as well as your pedagogical skills.*

» *Think about your best lessons and sequences of lessons when you have experienced 'flow' in your classroom. Reflect on this to identify what contributed to this successful event and take practical steps to experiment in your classroom and make it happen more often.*

Reflections on David's geography lesson

1. **What was this lesson about? What was David really trying to teach in this lesson? What was it the children were supposed to be able to do or understand?**

'Geography is maps' provides a concise definition for the subject discipline. Geography is about understanding spatial patterns and the particulars of place, asking how a particular place became as it is today. David was teaching a modified version of a classic decision-making lesson focused on location, location, location! As a teacher you need to have sufficient grasp of the subject discipline(s) you are teaching so that you are able to recognise the key concepts underlying particular topics, case studies and examples. You need to be able to analyse the lessons that you inherit when you join a teaching team or school and are working with a scheme of work produced by others. David needs to have subject knowledge about the Viking context (concrete) but also needs to have a good grasp of the underpinning concepts in geography of location and of decision-making in society (abstract).

The lesson as it stands engages learners with economic aspects of location by considering transport costs. This may be referred to as seeking the 'least-cost' or 'prime' location. The lesson also engages children in the social aspects of location by considering the different views of the villagers. It somewhat innocently assumes that all the settlers will have an equal say in choosing the location. Small changes to the lesson details could be made to

introduce environmental and political aspects of location, but arguably these might make it too complex. The key issue for consideration here is whether the desired learning for the lesson is limited to understanding something about Viking Britain, or whether there are bigger questions to ask: a greater 'sense of place'. These questions are about location of particular settlements and settlement patterns but even more abstractly about location decisions that help to explain the landscape. The concrete knowledge in the lesson is about Viking settlements, but the more abstract concept is about 'least-cost' location in geography, as well as being about social interaction and competing perspectives.

David unfortunately failed to really engage his learners with these bigger, more abstract, ideas, and therefore, despite facilitating a busy and active classroom, he missed the opportunity to enable his learners to approach a key concept within the subject discipline. If his routine planning and teaching included a metacognitive element then this may have helped him and his learners to reflect on the wider purposes of the lesson. Using hinge questions after each stage of the activity, and in a substantial plenary at the end of the topic, meta-learning in this case would have helped to develop a focus on the two key concepts of prime location and of decision-making in society. This is when the location of the new supermarket becomes a powerful example and connects the lesson more clearly to the learners' experiences. Adding a well-developed meta-learning plenary may have moved David's lesson from effective to inspirational.

2.   **What did the children seem to make of the lesson? In what way is the issue of the new supermarket relevant to the lesson?**

The children understandably focused on the concrete example used in the lesson and on the whole did not 'get' the big ideas of least-cost location and the social or political processes by which such decisions are made. The possible building of a new supermarket in the local area would form a perfect extension or parallel to the lesson because it is a location decision that is tangible, local and relevant to the children's lives. It highlights the economic, and especially the political, aspects of location decisions. Relevance is a hot topic in education, and we often read that learners find it helpful if learning is relevant to their lives. In encouraging the children to compare the Viking settlement activity to a contemporary supermarket planning application, the relevance comes through them seeing that geographical patterns develop over time. They then come to realise that the purpose of the lesson is about the key concept of 'location' rather than being about the detailed content of the history of Viking settlements.

However, we must not overlook the fact that the children really enjoyed this lesson and were fully engaged in the process, to the extent that some of them had obviously talked about it at home. David had fired their imaginations. The children had also, it seems, co-operated with each other really well, working in groups and engaging in discussion. We are certainly not denying that some learning took place. What we are saying is that there could be another layer or two to the learning, one looking at the abstract concepts and the other encouraging some reflection on the learning process itself. In fact, these approaches could be fed in relatively easily and this would take the learning to a new level.

3. What steps could the teacher take if they were teaching this lesson again to engage children with the big ideas underpinning the lesson?

The lesson might be run in pretty much the same way but perhaps combining a concrete learning outcome (to understand how the location of the Viking village may have been decided) with a more ambitious and more abstract learning outcome (to understand how humans make decisions and affect the patterns in our landscape). It is also possible to consider a learning outcome related to skill (to listen and speak within a group to reach agreement on a decision). Learning outcomes addressing abstract concepts need careful wording and would need further explanation during the lesson. The teacher should prepare a hinge question, one that the whole lesson turns upon, and that focuses on the abstract concept(s). This hinge question could be used half-way through the lesson and in the plenary and in this case might be: who and what has affected where things are found within the landscape?

As an alternative to presenting well-thought-out learning outcomes at the start of the lesson, it might be better to turn this on its head and interrupt the lesson half-way through and ask the children to come up with the learning outcomes. We might also consider whether the use of intended learning outcomes often tends to make us focus on more concrete outcomes and lose sight of the more abstract concepts and purposes of the lesson.

4. What are the implications of this case for the way teachers engage with national curriculum documents and develop school-level schemes of work as well as individual lessons?

In England a national curriculum has existed in various forms since 1988. New governments often fiddle with it in a centralised way that has direct implications for teachers' planning and therefore for children's learning. However, there is a complementary danger that some schools and teachers may interpret the curriculum guidance in a very direct and burdensome way and end up with stodgy schemes of work that are heavy with content.

Even if the curriculum guidance you have to consider as a teacher is content-based you might be able to step back and ask: 'Why was this piece of content chosen?' For example, in England the curriculum might include studying the 'Tudors' as an important period of history. But the reasons for studying the Tudors are not so that every child in England has some idea of who Henry VIII was or that he was a colourful character. The reasons for studying the Tudors is surely at least in part about the big ideas that are illustrated by investigating this period, including the role of religion and of the monarchy in the British government. In science the curriculum may include study of the alkali metals and partly this is because of the potential for dramatic explosive experiments such as putting potassium or magnesium into water. But more importantly, the alkali metals conveniently demonstrate the patterned relationship between atomic structure and reactivity.

Now some teachers may argue at this point that learners cannot cope with big ideas until they have learned the 'basics'. This is an attractive idea that might conveniently justify a relatively straightforward diet of teacher-led 'chalk and talk' lessons relying on transmission. But we know from innovative work such as Philosophy for Children (eg Hymer and Sutcliffe, 2012)

that even very young children can engage with big ideas such as the meaning of life or the concept of infinity. Lawrence Stenhouse uses learning to play chess as a simple model of learning within a subject discipline. He argues that an objectives-led approach may be useful for teaching the very basic moves, but to learn beyond that the teacher may merely advise on principles and help the learner to evaluate successes and failures. He suggests that teachers need to celebrate when the learner moves beyond their level of knowledge and beats them at chess (1975, p 37). We need to repeat the point emphasised by John Hattie: the teacher's job is not to make learning easy – it's to make it difficult. Approaching big ideas within the curriculum subject disciplines challenges learners and requires them to construct new ways of thinking about the world.

In the two examples from history and science it is important to note that the ways of thinking within those subject disciplines are as important as the key concepts. Young children should experience historical investigation and scientific experimentation and take early steps in 'becoming' a historian and a scientist. As Stenhouse points out, 'the superficialities of the disciplines may be taught by pure instruction, but the capacity to think within the disciplines can only be taught by inquiry'. Within an inquiry-based approach, 'one can think in a discipline at elementary as well as advanced levels of study' (1975, p 38).

If David were to consider a holistic view of supporting his learners as 'thinking like geographers', then this may help him see beyond the immediate confines of the lesson. Curriculum subject disciplines will of course usually include 'concrete' topics and there will be information and facts which need to be learned. However, we should expect children to handle factual content (concrete) at the same time as thinking more conceptually. Historians are often asked, 'If you had a time machine, where would you travel to?' and in a surprising response the historian Sam Willis's answer was 'to the future' (BBC, 2015). He argued that like all good historians he is interested in the effect of the past on the future, and he sees this as the most exciting thing about his work. We can apply this not only to David's geography lesson, but to any lesson where we are looking at historical contexts or artefacts. We and can keep our eye on the fact that learning is at its most exciting when learners make connections between 'then' and 'now' and see the relevance of particular issues to their own lives or to the lives of others. We've pointed out that people may argue that this comes later: first you learn concrete facts, then later you are able to make wider connections. We would argue that this approach does not need to be withheld until high school, college or university, but that engaging with abstract concepts can be part of learning from a much younger age.

Overall then, a teacher such as David, depending on their particular workplace setting, might adopt some combination of the following strategies when interpreting curriculum documents and planning schemes of work or individual lessons. Above all, it is important that teachers use their autonomy and creativity. They might:

- Step back from detailed content and consider how this lesson or series of lessons might really challenge the learners and stretch their thinking to approach some of the key concepts underpinning the subject discipline.

- If you are working with curriculum guidance documents that seem heavy on detailed content then check carefully the introduction and guidance sections. Sometimes curriculum guidance is interpreted by teachers or headteachers in a rigid and content-heavy way that was never the intention of the authors of the documents. Try to identify the big ideas or key concepts underpinning the design of the curriculum. Consider why some topics are included and others left out.

- Reflect on your personal beliefs around the level of abstraction and the big ideas in subject disciplines with which learners can meaningfully engage. If you are a teacher who believes in the need to 'cover the basics' before studying key concepts, then take a look at projects such as Philosophy for Children or even good-quality documentary television programmes aimed at children.

- Consider how your personal subject knowledge is affecting your chosen strategies. For example, where we have limited knowledge, we may tend to resort to teacher-led approaches, because these give more control and avoid questions from learners to which we do not know the answer.

We are not suggesting that you should reject or ignore the national, regional or institutional guidance on curriculum in your school setting. What we are suggesting is that you take control of it, working within your teaching teams, and interpret it wisely for the benefit of your learners. The main strategy we have proposed is to identify the key concepts and ways of knowing and to design learning activities that engage your learners with these key ideas and the skills required to 'become' a member of the subject discipline. Collaborate with other teachers in this work because you cannot expect to have really well-developed curriculum subject-discipline knowledge early in your career, especially if you are a primary teacher teaching across a range of subjects.

5. **What are the implications of this case for your approach to developing your own subject-discipline knowledge as a teacher?**

Always seek out and find out more about the big idea or key concept that is at the heart of the content 'covered' by your lessons. Seek out connections between your own subject specialism or interest and the lessons you are teaching, try to push forward your own learning of each curriculum subject discipline. Your subject-discipline knowledge should also develop by engaging with items in the news that touch upon the curriculum subject disciplines you are teaching. At the local, national and international level this is a great way to identify authentic problems and relate them back to key concepts and skills in the subject disciplines. By monitoring and searching online you will find multimedia resources available to use in your classroom.

Second, this case highlights the importance of building meta-learning into your teaching routines. This meta-learning should focus on the key concept underpinning the content of the lesson as well as on the process of learning. Provide opportunities for the learners to reflect on what they have learned and how they have learned it. Encourage learners to identify and explore the abstract concepts, to ask questions themselves, to make connections, rather than delivering a set of concrete learning outcomes and then gaining agreement at the end

that they have been met. Encourage them also to reflect on the process of learning during the lesson(s), considering what thinking skills they have applied and developed. Consider how planning in detail for a complex lesson, including the practical preparation of resources, might tend to keep us so busy as a teacher that we fail to see the wood for the trees. Planning needs to be as much about thinking as it is about practical preparation if we are to be ambitious as teachers.

Third, at a further level of metacognition for you as a teacher, you might usefully reflect on the dispositions that your lesson design and facilitation may be nurturing within your learners. A disposition is a tendency towards a particular intellectual behaviour. It means not only having a skill but being inclined to employ that skill by habit in your thinking and learning. Consider to what extent your lesson design and teaching may be influencing the thinking dispositions of your learners, for example, their learning habits of persistence, being questioning, working collaboratively, thinking logically or thinking creatively.

Things to try

» *You might develop your approach to planning by engaging selectively with an existing scheme and focusing on dispositions such as: setting high goals; managing distractions; curiosity; persistence; logical and creative thinking; collaborative and independent working; and reflection (Costa and Kallick, 2014; Lucas et al, 2013).*

» *Consider of one class you teach in order to connect abstract concepts in the curriculum to students' lives. Think through the different layers of knowledge you have about the class that influence your relationship with them and your plans for their learning. Start with the individual learners – names, their lives outside school, the way they interact with each other – consider gaps in your knowledge and how you will learn more. Next, think about your knowledge of the local community and consider how you might learn more and make connections in your lessons. Finally, consider your learners as global citizens and consider how you might develop their capacity to investigate, empathise, communicate and take action in relation to world issues (Mansilla and Jackson, 2011).*

Chapter 4 summary

This chapter has focused on the dilemma 'abstract versus concrete'. This dilemma creates cognitive dissonance for many teachers because we know that providing concrete examples is a key strategy in teacher explanations, and case studies and practical tasks are essential for engaging active learning.

Learning power

• Tackling challenging, complex tasks in your classroom, tasks that are also perhaps interdisciplinary, leads your learners beyond dependence on existing skills and knowledge so that they are forced to improvise and begin learning to learn.

- Metacognition involves reflecting on your own thinking and is an element of becoming a self-regulated learner. In the debriefing following a challenging task, time is well spent asking the question 'How did we learn?' and reflecting on the dispositions required for success.

- Meta-learning involves learners in stepping back from detailed content to consider the underlying key concepts that they have been approaching. Planned teacher questions and the plenary should challenge the learners to consider 'What did we learn?'

Teachers' workplace learning

- In planning lessons and sequences of lessons, you should focus primarily on key concepts within the curriculum subject – think 'location' rather than Viking settlement (de Echevarria and Patience, 2008)! If you are instructed to 'deliver' an existing programme, then work backwards to identify the underlying key concepts and mediate the set materials and activities as required.

- In planning your professional learning of the curriculum content, it is helpful to think of teacher knowledge as including pedagogy (how to teach) and curriculum subject knowledge (what subject content to teach). Where these two areas of knowledge overlap is called pedagogical content knowledge (how to teach a particular subject effectively).

- It is helpful to think of a sweet spot in your classroom teaching that occurs when your practice and identity overlap with pedagogical content knowledge. You are concentrating without concentrating and the challenge is high and the learning is good and life is good and you are in flow – if it has happened once, then you know it is possible again!

Taking it further

- Developing the emphasis on meta-learning and metacognition in your classroom will help you to raise your expectations and will encourage your learners to embrace challenge and accept failure and mistakes as opportunities for learning. Find out more and start to experiment with changes in your classroom practice that help your learners to become self-regulated learners: consider the Teachers' Pocketbook on *Teaching Thinking* for accessible further guidance. If you have access to an academic library then Barry Zimmerman's journal paper provides a useful overview (2002).

- Critically consider your curriculum subject knowledge. You might start by auditing your knowledge against a relevant curriculum document. By audit we mean self-assess your subject knowledge against the concepts or topics set out in the curriculum document.

- If a college entrance exam or other test dominates your work as a teacher then you should audit your curriculum knowledge against that, but remember to consider the

> broader aims of education and the dispositions your learners need for the future as well as the content they need to master to succeed in the test.

- Reflect on your approach to planning and consider how key concepts and meta-learning might become more explicit in your lessons.

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