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Models of Learning and Best Practice Pedagogy

This chapter begins with an exploration of the meaning of learning and the concept of best practice pedagogy in a constructivist classroom. You are introduced to a new model—the Best Practice Integrated Pedagogy (BPIP) model—to help you better understand how the learning process, how students learn and how we teach are all interrelated. The chapter then provides a brief discussion of the historical development of models of learning and how these have informed the understanding of effective pedagogy over the years. The social constructivist model is identified as the contemporary dominant model with incursions of the digital pedagogy model for twenty-first-century learning.

Many learning style models, cognitive processing taxonomies and instructional frameworks have been developed to facilitate teaching and learning. The chapter outlines some of the most popular of these. The concept of active learning is elucidated with a supporting hypothetical model and examples of many strategies that you can use to apply active learning in your teaching. The chapter ends with an outline of the nine Values for Australian Schooling that should guide your best practice pedagogy.

LEARNER OUTCOMES

Studying this chapter should enable you to:

- explain the meaning of learning and best practice pedagogy
- understand the historical development of the foundational models of learning
- describe taxonomies that help us understand cognitive processing
- understand the links between best practice pedagogy and active learning
- appreciate the range of Australia's values and their relevance in an integrated pedagogy
- plan a lesson for a primary class in which you could use your understanding of learning styles, taxonomies, instructional models and active learning strategies.

KEY TERMS

- active learning
- behaviourist model
- best practice pedagogy
- cognitivist model
- connectivist model
- learning
- model
- multiple intelligences
- social constructivist model

THE CONCEPT OF BEST PRACTICE PEDAGOGY

The history of pedagogy is awash with a plethora of scholarly attempts over 2000 years to answer three questions: What is learning? How does it happen? and, How can we facilitate it? The Greek philosophers Socrates (469–399 BC), Plato (427–347 BC) and Aristotle (384–322 BC) were among the well-known pioneers of the search for answers to these questions (Monroe, 1925), which have continued to exercise the minds of great philosophers, psychologists, neuroscientists and educationists over the centuries. This search has led to the development of a multitude of models or theories of learning, designed to explain how people learn and the best approaches to teaching. These models shed light on the meaning of best practice pedagogy.

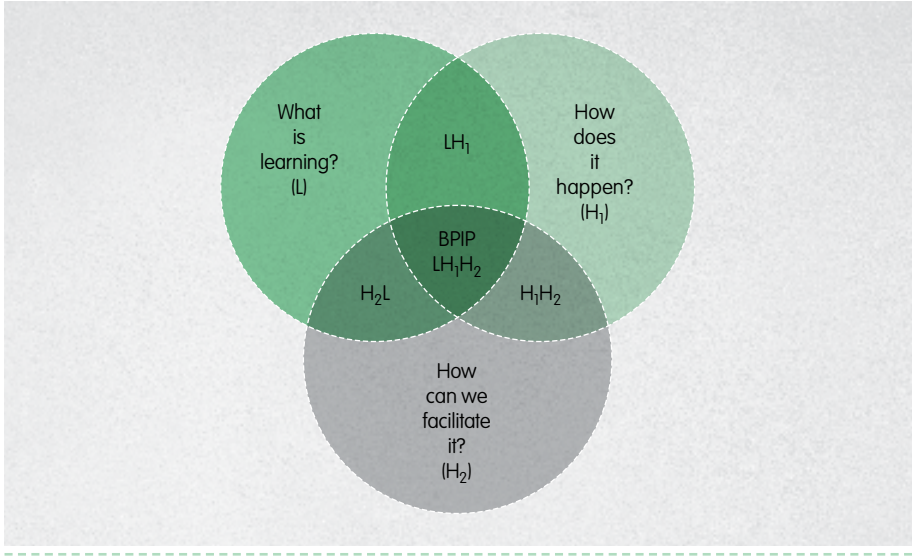
Quite often assessment and reporting are posited as separate from teaching and learning (pedagogy). This book asserts that teaching, learning, and assessment and reporting need to be treated as the three pillars of curriculum in an integrated pedagogy. In an integrated pedagogy, **best practice pedagogy** can be defined as teaching, learning, assessment and curriculum, which produce superior results among learners. Best practice pedagogy has been formally defined as 'a program, process, and/or procedure that continuously and regularly produces superior results when compared with other strategies' (USDHHS, 2003). It is pedagogy that challenges learners to excel at their personal best, learning in their different styles and equipping them with the knowledge, skills and competences that they will need as productive citizens in the twenty-first-century digital economy. Such pedagogy helps learners develop their critical-thinking and problem-solving skills, to be self-directed learners, and to reason without taking things for granted. It discourages rote learning and encourages students to develop higher quality learning and a deep understanding of what they learn through analysing, evaluating and creating new ideas and applying what they learn in authentic, real-life contexts beyond the classroom and school. What these children learn sharpens their curiosity and imagination.

Best practice pedagogy
Teaching, learning, assessment and curriculum, which continuously and regularly produce superior results among learners, when compared to other strategies.

Best practice pedagogy puts students at the centre of the teaching, learning and curriculum processes, and utilises assessment for formative purposes with immediate constructive feedback loops. It seeks to maximise student involvement and engagement and employs strategies that promote active learning, deep level learning and mastery of fundamental concepts by the students. It is based on well-developed theories, applies relevant principles and strategies and meets the expectations of different stakeholders. Its foundational philosophical stance is that what happens in the classroom is only of value if it benefits the children and

children are the primary focus of teaching. It sets high expectations for all the students and expresses the belief that every child can succeed. It tries to make learning challenging and interesting, particularly with the use of technology and active collaborative learning strategies. In best practice pedagogy students and teachers are both learners and teachers continually learn from their experiences through reflective strategies, collaborative activities with their peers and ongoing professional development as lifelong learners. They are always seeking answers to the three questions posed at the start of this section. The answers to these questions enable us to implement a pedagogically sound pedagogy; hence best practice pedagogy. They represent the core of best practice in an integrated pedagogy, which is represented in my model for best practice pedagogy (the BPIP model) in Figure 1.1.

FIGURE 1.1 THE BEST PRACTICE INTEGRATED PEDAGOGY (BPIP) MODEL



The BPIP model is designed to help you better understand the meaning of best practice pedagogy by creating a synthesis of what each of the three questions involves, and how the interactions among the variables of the three questions constitute the core of best practice pedagogy. In the model, each of the questions is represented by a circle. The first question, What is learning?, is represented with the letter [L] in the top left-hand circle of the model. To the right of that, the second question, How does it happen?, is represented with the label [H_1] in the circle. And the third question, How can we facilitate it?, is represented with the label [H_2] in the bottom circle.

As these three primary circles intersect, they create segments of pedagogical relationships among the questions, which need to be understood to appreciate the meaning of best practice pedagogy. The intersection of circles L and H_1, shown as LH_1, represents the need for us to know learning as a process and the theories that help us to understand how this process happens in the construction of knowledge. The intersection of circle H_1 and H_2, shown as H_1H_2, emphasises the need to align our understanding of theories of learning with models, principles and strategies for effective quality teaching and assessment, as well as professional teaching standards and curriculum. The intersection of circles H_2 and L, shown as H_2L, represents the teacher's understanding of learning and the attributes of the learners involved in learning. What learning is (L), how students learn (H_1) and how we can help them learn (H_2) are the heart of creating best practice in an integrated pedagogy as represented by LH_1H_2 or the heart of the BPIP model. This model is thus consistent with Fink's (2003) systematic learning-centred design model, which postulates that what and how students learn is at the heart of creating significant learning and that investigating these questions helps us to implement an effective pedagogy (Bell and Kahrhoff, 2006).

In a study that investigated 'good practice' among undergraduates, Chickering and Gamson (1987) identified seven principles for good practice and their multiple effects, which improve education. As shown in Table 1.1, their findings lend support to the BPIP model.

TABLE 1.1 THE SEVEN PRINCIPLES OF GOOD PRACTICE AND THE BEST PRACTICE INTEGRATED PEDAGOGY MODEL

	GOOD PRACTICE PRINCIPLE (CHICKERING AND GAMSON, 1987)	ELEMENT OF OUR BEST PRACTICE PEDAGOGY MODEL
	Encourages contacts between students and faculty	H_2
	Develops reciprocity and cooperation among students	L
	Uses active learning techniques	L
	Gives prompt feedback	H_2
	Emphasises time on task	L
	Communicates high expectations	H_2
	Respects diverse talents and ways of learning	H_2
Multiple effects	Activity	LH_1H_2
	Expectations	LH_1H_2

(*continued*)

TABLE 1.1 (*CONTINUED*)

	GOOD PRACTICE PRINCIPLE (CHICKERING AND GAMSON, 1987)	ELEMENT OF OUR BEST PRACTICE PEDAGOGY MODEL
	Cooperation	H_1H_2
	Interaction	H_1H_2
	Diversity	LH_1H_2
	Responsibility	LH_1

Source: Chickering and Gamson, 1987.

Each of the questions that comprise the BPIP model to elucidate the meaning of best practice pedagogy is examined below.

What is learning?

Learning A process that leads to change, which occurs as a result of experience and increases the potential for improved performance and future learning.

Whether you are still at university training to be a teacher, or whether you are in your early years or advanced years of teaching, this is a question that is central to your pedagogical practice. It is represented in circle L in Figure 1.1. An understanding of what **learning** is and the processes it involves helps us to gain a better understanding of how children learn and informs how we can facilitate their learning. However, as Knud Illeris (2009, p. 18), internationally acknowledged as an innovative contributor to learning theory, warns, 'learning is a very complicated matter and there is no generally accepted definition of the concept' … The concept of learning includes a very extensive and complicated set of processes, and comprehensive understanding is not only a matter of the nature of the learning process, … (but also of) all the conditions that influence and are influenced by this process'. Let's try to simplify this rather slippery and very complex concept, by taking a careful look at what learning really is.

Ambrose et al. (2010, p. 3) define 'Learning (as) a *process* that leads to *change*, which occurs as a result of *experience* and increases the potential for improved performance and future learning' (italics in original). You can see from this definition that learning is an experiential process involving action whose consequence is the improvement of performance. The experiential process involves changes in knowledge, understanding, attitude and ability to apply skills to a task in a given context. Because the change brings about improved performance at the time it occurs and in the future, the learning process is seen as leading to permanent changes in behaviour and attitudes. It is this permanency that makes Barry and King (2001, p. 18) use Shuell's definition of learning as

'an enduring change in behaviour, or in the capacity to behave in a given fashion, which results from practice or other forms of experience'.

Illeris (2007, p. 3) agrees when he defines learning as, 'any process that in living organisms leads to permanent capacity change and which is not solely due to biological maturation or ageing'. He explains that whereas learning has traditionally meant the acquisition of knowledge and skills, our understanding now is that it covers much more than just knowledge and skills and includes emotional and social, as well as societal dimensions. You can gather from these definitions that learning is not passive; that it is a fundamentally constructivist process in which learners actively build or construct their understanding of the information they come into contact with, which we call learning. Wilson and Peterson (2006, p. 1) sum up well when they say, 'learning is a process of active construction; it is a social phenomenon, as well as an individual experience'. This understanding leads us to ask the second question, How does learning happen?

How does learning happen?

In answering this question we can examine the links between circle L and circle H_1 in Figure 1.1. Brain research, such as that conducted by Williams and Dunn (2008), has shed light on how learning happens (H_1) and how we can improve learning (H_2L). The learning process involves our brain taking information, filtering it, organising it to make sense of it and storing into memory what is understood as meaningful to the learner, to be used in the future. Williams and Dunn's (2008) research identifies nine brain processes that help us to answer the question, How does learning happen? The first process is contextualisation. This step requires that the new information learners receive relate to the learners' real-life context. The new information makes meaning through personal context. The personal context does not mean isolation. That wouldn't be 'real life'. It includes how learners interact and relate to those around them, taking into consideration aspects of culture like language and social interactions.

Second, learning requires motivation to happen. If learners are not motivated, they make no effort to commit the new information to memory and so no permanent change occurs as a result of exposure to the new information. Third, learning happens when it is reinforced with hands-on experience. The hands-on experience gives learners the opportunity to examine the new information and see how its parts link together to make sense as a whole.

The fourth process in which learning happens is through extending learners' schemas. Learners do this by linking new information to their prior knowledge. As we shall see in answering the third question (H_2), this is the step where

you, the teacher, can help your students make connections between what you have already taught them and what is new, so as to facilitate their making this connection.

The fifth process is the 'chunking' stage in which the brain groups data according to themes or concepts and assigns meaning to the chunks. The chunks contain information that is conceptually related and by grouping it, the brain is better able to assign meaning. The sixth process is reflection. In this phase, the brain thinks about what has been learnt and allocates the newly acquired useful information to long-term memory.

In the seventh process, the brain looks for associations between what is being learnt and the learner's emotions. Williams and Dunn say that emotions interact with reason to support learning. Learning happens faster and is retained for longer periods when the prevailing senses and emotions are positive or supportive. The eighth process relates to **multiple intelligences**. Learning happens more readily when the new information aligns better with the learner's ways of being smart. Howard Gardner (1983; 2013) has identified ten multiple intelligences, representing different ways learners can be smart, as we shall discuss further in this chapter. The final understanding of how learning occurs, according to Williams and Dunn, is that it requires a lot of energy for the brain cells to function well. This energy is provided by repetitive stimuli or messages, which give the brain a chance to rehearse the new information and learn it before it fades. Thus we can conclude, that learners learn through a process of actively constructing knowledge from the experiences they encounter, building on their existing fund of knowledge and organising new information in the light of prior knowledge to make their own meaning.

Multiple intelligences The conception by Howard Gardner that all people have different kinds of intelligence rather than one intelligence. Thus, all children are 'smart' in different ways. It is not how smart each child is, but how he or she is smart.

How can we facilitate learning?

We have already seen in the BPIP model that learning is an active process, that it needs to be contextualised in the learner's real-life situation and that it is reinforced by hands-on experiences. Informed by this understanding (LH_1), an effective way to facilitate learning (LH_1H_2) is by creating a learning environment which gives learners opportunities to be actively engaged in real-life hands-on activities. In the real-life context, the learner does not learn alone. This understanding helps us facilitate learning by giving learners opportunities to work collaboratively with others. We can do this, for instance, by organising for the children to work in pairs or in cooperative learning teams in which they can work in special structures to maximise the benefits of cooperative learning (Kagan, 1994).

We also know from H_2 that repetitive stimulation enhances learning. We can therefore facilitate learning by giving learners projects in which they integrate cross-curricular knowledge from different key learning areas (KLAs) to maximise the positive effects of repetitive stimuli to the brain.

H_1 (how learning happens) is informed by Williams and Dunn's (2008) learning process number four that prior knowledge is crucial in the learning process. We can use this understanding (LH_1) to introduce what we teach (H_1H_2) by linking it to what we know the children have already learnt (H_2L).

Learning process five of the Williams and Dunn model tells us that learning happens better when the brain can organise data into 'chunks' or concepts and themes of related meanings. This informs H_1 of the BPIP model. Also taking this into account enables us to facilitate learning H_2 by structuring the information we give to learners in an orderly manner, which shows how ideas are related to concepts and how the concepts can be grouped into themes to provide relational analysis (Miles and Huberman, 1994) of the meaning embedded in the data. For example, a new topic can be introduced by asking children to design a concept map of what they already know about the topic. This is usually called 'brain-storming' and helps learners to see the small and big ideas and how these relate to each other to make meaning. It helps them to see gaps and it gives you the opportunity to facilitate learning by providing a scaffold that helps them to organise the information into knowledge and understanding.

How learning happens in H_1 informs us that motivation plays an important role in children's learning. Creating a motivational learning environment (H_2L) is therefore a big facilitator of learning. Much as we know that motivation (defined as 'an internal state that arouses, directs and maintains behaviour'; Woolfolk, 2008, p. 336) is a very complex concept, this understanding that children need to be goal-oriented and with a desire to learn helps us plan and apply strategies which will encourage students to want to participate and to achieve learning outcomes, thus improving chances for effective teaching and learning (LH_1H_2).

Also helping us to understand H_1 is Williams and Dunn's (2008) process number eight, which informs us that children learn more easily when the information they are required to learn (L) aligns well (H_2) with their way of learning. Therefore, we can facilitate learning by capitalising on our understanding of Howard Gardner's (2006) multiple intelligences, in which he sees intelligence as comprising 'many different and discrete facets of cognition, … and people have different cognitive strengths and contrasting styles' (p. 5). This means planning teaching (LH_1H_2) to allow for multiple approaches to learning and not using only one strategy for teaching or assessment in facilitating learning by all students.

The final learning process in Williams and Dunn's (2008) model informs H_1 of how learning happens, as well as our teaching (H_2) to allow for reflection and to provide formative feedback to students so as to move our practice towards becoming a Best Practice Integrated Pedagogy ($L_1H_1H_2$) as represented in Figure 1.1.

Role of models in understanding best practice pedagogy

Model
A conceptual structure that represents a way of thinking of or understanding relationships involved in a process.

A **model** is a conceptual structure that represents a way of thinking of or understanding relationships involved in a process. It postulates on the relationships involved, the principles that underpin those relationships and the structural and cultural dynamics responsible for causes and effects of what happens in the model. For example, the BPIP model helps us to understand relationships between learning, how it happens and how we can facilitate it. If we can facilitate learning efficiently and effectively, as postulated by this model, then we are utilising best practice pedagogy. This important idea will be considered further, after discussing the major foundational models of learning.

reflect & revise

1. Learning is not an easy concept to define and has been defined in many different ways. How do the definitions given in this section align with your own understanding of the meaning of learning? Which one do you prefer? Why?
2. Critically reflect on a lesson you have completed with one of your classes recently. To what extent would you say it reflected best practice?
3. If you had the opportunity to conduct the same lesson again with the same class, how could you make it a better reflection of best practice in an integrated pedagogy?
4. What is your understanding of an 'integrated pedagogy'?
5. Why do you think it is important to treat the different components of pedagogy as a holistic whole rather than independent units?
6. To what extent does the BPIP model help your understanding of best practice in an integrated pedagogy?
7. Does this model reflect your own views about the learning and how you can facilitate it? What suggestions can you make to improve on it?

FOUNDATIONAL MODELS OF LEARNING

This section will focus on those models agreed on by most scholars as providing the basis for a primary understanding of how learning happens and how we can facilitate it.

The empty vessel model

One of the earliest theories of learning was founded on the belief that effective instruction takes place when a teacher transfers or transmits objective knowledge to the learner. This is why this conceptualisation of learning was popularly referred to as the 'transmission' model of learning and the process as the 'transmission mechanism'. According to the *transmission model of learning*, the learner played no active role in the learning process and was simply a passive recipient of knowledge. The model was thus often characterised by the metaphor of an 'empty vessel', which played no role as it was being filled with knowledge, or as knowledge was being 'poured' into it. Similar conceptualisation also used the metaphor of a 'sponge' that simply absorbed whatever liquid was poured onto it.

Examples of teaching guided by the transmission model abound in the early Catholic Church, around 500 AD, within its churches, monasteries, schools and even universities through to around 1500 AD. In the churches, parishioners sat quietly while the priest literally filled them with the word of the gospels. In the Middle Ages, Benedictine, Cistercian and Carthusian monks received instruction from high priests and bishops without even uttering a word. In turn, the monks taught in schools where again, transmission of information to passive learners was the modus operandi (Monroe, 1925). This model guided instruction throughout the Western world for many centuries. For example, in a study of teaching and learning in the USA from 1890 to 1990, Cuban (1993) noted that teachers talked and students were directed to listen and take down notes in order to learn. Unfortunately, as Smith et al. (2005, p. 2) pointed out, in this 'Pour it in model, the information passes from the notes of the professor to the notes of the students without passing through the mind of either'. However, notwithstanding the deficiencies of this model, the transmission model remains foundational to pedagogical practice even today, as represented, for instance, in the orthodoxy lecture method of instruction in universities from Harvard to Oxford and from Cambridge to Sydney.

The blank tablet model

This model is attributed to John Locke (1632–1704), who theorised that the mind of a child before it receives the impressions gained from experience is a blank tablet. According to Locke, the child's blank slate (tabula rasa) received impressions from the child's own experiences. This model originated from the work of Aristotle who as a student of Plato proposed that knowledge is found,

not inside people's minds, but outside, using their senses. This gave rise to the *empiricism model of learning*, that is, the theory that knowledge comes only or primarily from sensory experiences.

Following Aristotle's model, Locke proposed that the way to help children learn was to design instances which gave them experiences (Monroe, 1925). This model gave birth to the scientific method which is characterised as a method of inquiry in which knowledge is gained through a systematic methodology of experimentation and making observations which enable the learner to answer key questions, and thus know the truth. It followed, therefore, that exposing learners to different experiences would enable them to develop understanding and expertise in different areas of knowledge. This premise gave birth to the discipline-based liberal arts education taught in many universities.

To the extent that the tabula rasa model provides for experimentation, questioning and observation on the part of the learner, it represents a significant departure from the completely non-participatory nature of the transmission model. Because it introduces the idea that stimuli experienced by a child influence the child's learning or behaviour, it can be seen as a humble precursor to the behaviourist model.

Behaviourist model The theory that learning occurs through a process of events happening at the same time, with one being the stimulus and the other the conditioned response.

The **behaviourist model** of learning is attributed to American behaviourist and social philosopher, Burrhus Frederic Skinner (1904–90). In his seminal book, *Science and Human Behavior*, Skinner (1953) postulated that learning occurs through a process of events happening at the same time, with one being the stimulus and the other the conditioned response. He focused primarily on the relationship between the environment and behaviour, and saw learning as the result of forming connections between stimuli from that environment and related responses.

It was similar to the learning by conditioning theory, developed by Russian physiologist Ivan Pavlov (1849–1936) on his work with dogs; and even closer to Edward Thorndike's (1874–1949) theorisation that for children to learn, we should structure learning environments that send specified stimuli designed to produce the desired learning. It was Skinner, however, who developed and popularised the behaviourist model in educational contexts. In the behaviourist model, motivation to learn was driven by rewards and punishments (Bransford, Brown and Cocking, 2000). This theory was foundational to several behavioural instructional models in education, such as that developed by Gagne (1977), which consisted of the following nine steps:

1 Gaining attention
2 Expectancy: Informing the learner of the objective

3 Memory retrieval: stimulating recall of prerequisite learning
4 Presenting stimulus materials
5 Providing learning guidance
6 Eliciting performance
7 Providing feedback
8 Assessing performance
9 Enhancing retention and transfer to the job.

Skinner (1974) argued that since it was not possible to fully understand the inner processes of learners using the scientific method, the best way to know their thinking and to influence their learning was through observing and working with cause-and-effect relationships (that is, their behaviour) in which the children were involved. Thus, the behaviourists did not distinguish between thinking and behaviour.

The cognitivist/individual constructivist model

In response to behaviourism, the **cognitivist model** of learning postulated that the way people think influences their behaviour, and therefore thinking is distinct from behaviour. Rather than focusing on the relationship between the environment and behaviour, the cognitivist model focused on the relationship between the learner and the environment. Its central proposition was that individual learners' current levels of knowledge, experiences and skills have a profound impact on the way they make meaning of the environment and therefore what they learn from their interaction with the environment.

Cognitivist model
The theory of learning that held that learning occurs as individual learners think and actively participate in what is happening in order to learn.

One of the founding fathers of cognitivism was the Swiss psychologist Jean Piaget (1896–1980), to whom is attributed the cognitive developmental theory. This theory postulates that every individual passes through four successive stages of intellectual development, namely: sensori-motor: 0–2 years; preoperational: 2–7 years; concrete operational: 7–11 years; and formal operational: 11 years and above. Piaget (1923) expressed the belief that humans are naturally curious about their environment and constantly explore it in their attempts to make sense of it as they internalise knowledge (that is, learn) across these stages. He believed that individuals need to construct meaning of the world for themselves and, accordingly, his theory became the first model of constructivist learning, with the focus on the individual learner (hence individual constructivist model), as learning was internalised and not socially driven.

Piaget based his understanding of cognitive development on observations of children and adolescents whom he studied as they solved problems he set

them in natural situations (Piaget, 1923). He concluded that learners construct new knowledge from their experiences through two processes, which he called *assimilation* and *accommodation*. Piaget (1954) said that learners approach learning with an existing schema and when they interact with new experiences and ideas, they organise the new information and add it to their existing schema in a process of assimilation. However, when new information cannot be absorbed into the existing schema because it contradicts the learner's existing way of thinking, there is what he called 'cognitive conflict'. Piaget argued that learners do not simply reject the new experience but can modify their current way of thinking through a process of accommodation by which they open up and accept the new experience. Learners thus raise their way of thinking from a lower-level schema to a higher-level schema. These two processes—assimilation and accommodation—led to what Piaget called *adaptation*, that is, the basic life process that helped a person adjust to the demands of the environment (Piaget, 1971). Thus Piaget conceptualised learning as a process of continuous interaction between the learner and the environment. Piaget's theory became the foundational model for the constructivist proposition that holds that children learn best when they are given opportunities to be actively involved in the construction of knowing.

The constructivist/social constructivist model

Social constructivist model Theory of learning that focused on the social aspects of learning and postulated that the social occasions of conversation, discussion, joint work, groups and debate play a critical role in learning.

What is generally referred to as the constructivist model of learning should actually be called the **social constructivist model**, to distinguish it from Piaget's individual constructivist model discussed above. This model arose out of cognitivist theorists developing an understanding that learning is a social experience rather than an individual one. They argued that the mind constructs knowledge through a process of active construction rather than acquisition. The Russian cognitive psychologist Lev Vygotsky (1896–1934) is the most famous and the foundational theorist for this model.

Focusing his intellectual development studies on the social environment of the child, Vygotsky (1929; 1978; 1981) produced what became known as the developmental theory of social constructivism, whose key proposition was that children's cognitive development is influenced most by interaction with people, especially parents, other children, teachers and mentors in the child's social environment. He argued that it is the collaborative interactions between learners and members of their immediate society that enable learners to make meaning of their world in their cultural setting. He wrote: 'In the process of development, the child not only masters the items of cultural experience but the habits and

forms of cultural behaviour, the cultural methods of reasoning' (Vygotsky, 1929, p. 415). He argued, therefore, that knowledge is not a mental state but an experienced relationship within the cultural and social contexts that influence learning (Dewey, 1981). Within the social contexts, language was seen as a means for social coordination and adaptation and so learning was also understood as a process of what Maturana and Varela (1987) characterised as human languaging. Vygotsky, like Piaget, also believed that individual learners need to personally make sense of ideas, concepts and skills of the culture in which they are immersed.

Another significant aspect of Vygotsky's theory that is foundational to pedagogy today is his so-called zone of proximal development (ZPD). Vygotsky explained the ZPD as the level of competence on a task in which a learner cannot yet master the task working by themselves but can complete the task successfully if given appropriate support by a more capable mentor. These two dimensions of Vygotsky's cognitive development theory have significant implications for understanding how learners learn. First, one of the key implications is that the social-cultural-technological environment within which children are immersed has a profound influence on their cognitive development. Second, learners can extend their ZPD with the assistance of anyone who recognises their current learning need and is capable of lending the needed support. That person does not have to be a qualified classroom teacher or academic pedagogue. It could be another child, another learning adult or peer, or a parent. This theoretical perspective informs our understanding of the role of cooperative learning strategies and social media in facilitating learning.

The connectivist model

More recently, there has been an increasing understanding that computer-mediated tools and digital technologies can assist in the construction of foundational knowledge in socially oriented contexts. This understanding has given rise to the **connectivist model**. Leaders in this field include Don Tapscott (1997; 2009), Marc Prensky (2001a; 2001b), George Siemens and Stephen Downes (Siemens, 2004; 2006), and Frank Kelly, Ted McCain and Ian Jukes (2009).The model was developed by Siemens and Downes (Siemens, 2004) to include the impact of digital technologies on learning. Whereas earlier paradigms attributed learning only to humans, the connectivist paradigm postulates that the construction of knowledge includes learning by individuals, machines, groups and organisations, as well as other systems (Siemens, 2006).

Connectivist model Relatively new approach to learning based on the understanding that computer-mediated tools and instructional digital technologies can assist in the construction of foundational knowledge in socially oriented contexts.

It argues that learning can be identified with actionable knowledge and that this knowledge can reside not only in the minds of people, but also outside the mind in the form of databases, intelligent machines and other formats (Narayan and Kumari, 2011, p. 153). Siemens (2004) explains that in the connectivist model we have a new technological society in which 'know-how' and 'know-what' are being supplemented with 'know-where' to find the knowledge that is required to make sense of a given situation.

In the new technological society proposed by the connectivist model, we see learners interconnected in collaborative environments that are open-ended and in which computer mediation, driven by internet technologies, facilitates and enhances learning. Computer-mediated digital technologies can be used as tools for active learning, critical thinking and problem solving in twenty-first-century learning.

Importance of foundational models of learning

Table 1.2 provides a synthesis of each of the foundational models to show their importance in the Best Practice Integrated Pedagogy (BPIP) model (see Figure 1.1). The synthesis gives a bird's-eye view of the contribution each model has made to an understanding of the process of learning (L), how learning happens (H_1) and how we can facilitate learning (H_2). The synthesis also lists the leading proponents of each model of learning.

Table 1.2 shows how pedagogical understanding of what learning is and how it happens has shifted over the centuries. First were the transmission and blank slate models in which learning was primarily a passive gift to the learner by the teacher, who was the metaphorical fountain of knowledge. This was followed by the behaviourists' understanding of learning as a conditioned response to external stimuli provided by the teacher. The realisation that learning was a social rather than a private construction of knowledge led to the social constructivist model. This model is today being augmented by the connectivist model, which seeks to maximise the potential benefits of digital technologies in learning and teaching. Thus, each of these models has played an important role in helping us to develop a better understanding of the process of learning.

The realisation that learning involves active construction of knowing by the learner has had an important influence on pedagogical principles and strategies used in teaching and assessment and on curriculum development. For example, as can be seen in the synthesis in Table 1.2, the role of teacher has moved from being that of deliverer of knowledge to providing a facilitating scaffold that enables learners to construct their own knowledge.

TABLE 1.2 IMPORTANCE OF THE FOUNDATIONAL MODELS OF LEARNING TO BEST PRACTICE PEDAGOGY

		THE THREE KEY PEDAGOGICAL QUESTIONS		
		WHAT IS LEARNING? (L)	**HOW DOES IT HAPPEN? (H_1)**	**HOW CAN WE FACILITATE IT? (H_2)**
The foundational models of learning	Transmission and tabula rasa models [*Aristotle, Plato, John Locke*]	• A gift to the learner • Passive absorption • Empty vessel, sponge, blank slate, tabula rasa	• Transmitted by teacher • Rote • Memorisation • Recall • Factual • From fountain of knowledge	• Pour it in • Deliver • Lecture • Dictate • Instruct • Straightforward work
	Behaviourist models [*B.F. Skinner, Ivan Pavlov; Edward Thorndike*]	• Response to stimulus/ stimuli from the environment • Basic concepts	• Change in external behaviour due to conditioning • Memorising and responding to targeted stimuli	• Present stimuli • Observe response • Provide feedback • Reinforcement
	Cognitivist and individual constructivist models [*Jean Piaget*]	• Active discovery and construction of knowledge • Strategies, rules and patterns • Complex and intellectual storage • Subjective reality	• Individual interaction with environment • Personal discovery and experimentation • Assimilation • Accommodation • Adaptation • Reframing mental models	• Activate current schema • Apply cognitive learning strategies • Opportunities to engage, apply, analyse
	Social constructivist models [*Lev Vygotsky*]	• Active discovery and construction of knowledge	• Authentic social–cultural relationships • Cooperative learning • Problem solving • Shared meaning • Zone of proximal development (ZPD)	• Scaffold teamwork • Opportunities to collaborate • Explain • Discuss • Argue • Create as a team • Extend ZPD

(*continued*)

TABLE 1.2 (*CONTINUED*)

		THE THREE KEY PEDAGOGICAL QUESTIONS		
		WHAT IS LEARNING? (L)	HOW DOES IT HAPPEN? (H_1)	HOW CAN WE FACILITATE IT? (H_2)
	The connectivist model [*George Siemens; Stephen Downes; Marc Prensky; Frank Kelly, Ted McCain and Ian Jukes*]	• Connecting specialised nodes of information • Computer-mediated • Humans, smart machines and systems	• Socially oriented contexts • Internet interconnected • Intelligent machines • Technological society • Creation of new knowledge	• Embed computer-mediated digital tools • Embed social media technologies • Develop peer learning networks • Critical thinking • Architect of educative experiences digitally and socially

classroom activity 1.1 FOUNDATIONAL MODELS IN PRACTICE

1 Consider the foundational models of pedagogy reviewed above. How do your teaching practices align with the three pedagogical questions of:
   a What is learning?
   b How does it happen?
   c How can we facilitate it?
2 With which model do your own practices provide a good fit?
3 To what extent do your teaching and assessment practices reflect compliance with the transmission model?
4 If you were to defend application of the transmission model, what would be your arguments?
5 If you were required to choose between applying the Vygotskyian social constructivist model and the connectivist model in your own teaching:
   a Which one would you choose?
   b What are the reasons for your choice?

OTHER MODELS AND FRAMEWORKS INFORMING LEARNING

This section considers a number of models, frameworks and taxonomies which, though not regarded as foundational models, have nevertheless provided valuable insights into pedagogical practice and curriculum design.

Learning styles models

Learning style is taken here to include cognitive style and is defined by Allport (1937) as 'an individual's typical or habitual mode of problem solving, thinking, perceiving and remembering. (It is) the preferred way in which an individual approaches a task or learning situation' (Cassidy, 2004, p. 421). Rita and Kenneth Dunn (1978) define it simply as 'the way in which each learner begins to concentrate on, process, use and retain new and difficult information'. Similarly, Litzinger and Osif (1992, p. 73) describe learning styles as 'the different ways in which children and adults think and learn'. Learning styles models propose that every child learns and processes information in a way that is different and unique to the individual. They posit that the way learners approach learning influences how they learn and the learning outcomes achieved. They assert that when learners are taught according to their individual learning styles, their academic achievement, as well as attitude, self-esteem, attitude and expectations of the future improve.

Cassidy (2004) suggests that learning styles models have been common in education for nearly fifty years. This theorisation is important in at least two pedagogical dimensions. First, it helps you understand that there is no one best way to learn or to study. Second, it helps you to understand that for you to create an optimal learning environment for your students, you must use instructional strategies that match each learner's individual learning style. Yerxa (2003) proposes that even a mere realisation that there can be different ways to approach teaching and learning can make a difference to how you teach and how the children learn.

The Academic Skills Centre at the University of Melbourne (2014) alerts its students to seven learning styles, described as follows. Visual learners remember visual details and prefer to see what is being learnt. Verbal learners enjoy discussion and like to talk aloud and discuss material in groups. Reflective learners learn best when time is allocated to thinking about and digesting new information. Sensory learners like to learn by touching and feeling objects

and models. Intuitive learners prefer discovering new relationships and can innovate in their approaches to problem solving. Sequential learners like to start from the beginning, knowing the detailed facts first and then building on these. Global learners may be able solve complex problems quickly or put things in novel ways once they have grasped the bigger picture, but may have difficulty explaining how they did it.

Other scholars have identified different styles as shown in, for instance, Dunn and Dunn's model, Wolf and Kolb's model, and Honey and Mumford's model, outlined below.

Dunn and Dunn's learning styles model

Doctors Rita and Kenneth Dunn started developing their learning styles model in 1970 and have conducted extensive research on it (Nolan and Cooper, 2001). Their model, summarised in Table 1.3, proposes a total of twenty-one different learning styles when learning in contexts that provide stimuli in five dimensions. These five contextual dimensions are environmental, emotional, sociological, physical and psychological.

TABLE 1.3 DUNN AND DUNN'S LEARNING STYLES MODEL

	THE LEARNING PREFERENCES OR STYLES				
Stimuli dimensions	Environmental	Sound	Light	Temperature	Design
		E.g. likes background music while studying	E.g. likes dim or bright light to concentrate	E.g. likes a cool or warm study room	E.g. seating and furniture preferred
	Emotional	Motivation	Persistence	Responsibility	Structure
		E.g. motivated by adult feedback	E.g. learners' attention span	E.g. requiring little supervision	E.g. likes step-by-step instruction
	Sociological	Self	Pair	Teams and peers	Adult/Varied
		E.g. prefers to work alone	E.g. prefers to work with one other person	E.g. prefers to work as a member of a team	E.g. likes routines, or varied procedures
	Physical	Perceptual	Intake	Time	Mobility
		E.g. prefers tactile learning	E.g. likes eating or drinking while studying	E.g. a day or a night person	E.g. sits still or moves around while learning

	THE LEARNING PREFERENCES OR STYLES				
	Psychological	Global/Analytic	Hemisphericity	Impulsive	Reflective
		E.g. likes 'big-picture' approach or prefers more details	E.g. left (sequential) or right (simultaneous) brain thinking	E.g. likes quick decision making	E.g. takes time to consider all the options

Source: Nolan and Cooper, 2001.

Wolf and Kolb's learning styles model

Wolf and Kolb (see Kolb, 1984) theorised that learning styles could be seen as a continuum comprising four approaches to learning and four types of learning abilities, these being: concrete experience; reflective observation; abstract conceptualisation; and active experimentation. These learning abilities relate to four learning styles that they called accommodators learning style; divergers learning style; assimilators learning style; and convergers learning style.

Table 1.4 shows examples of learning strategies for each of the different learning styles, as suggested by Hartman (1995). Because learning styles were postulated to be a continuum, each is associated with two learning abilities and preferences, which include an overlap as shown in the table.

TABLE 1.4 WOLF AND KOLB'S LEARNING STYLES

LEARNING STYLE	LEARNING ABILITY	LEARNING PREFERENCE	TEACHING STRATEGY
Accommodators	Active experimentation	Doing things Using experiments to solve problems Project based work	Small group discussion Offer simulations, case studies and homework
	Concrete experience	Being involved in new experiences Judgment based on feelings Empathetic and people oriented	Offer laboratories, field work, observations or trigger films
Divergers	Concrete experience		
	Reflective observation	Watching others or developing careful observation about own experience Tentative and calculating	Use logs, journals, brainstorming, or self-reflection exercises

(*continued*)

TABLE 1.4 (*CONTINUED*)

LEARNING STYLE	LEARNING ABILITY	LEARNING PREFERENCE	TEACHING STRATEGY
Assimilators	Reflective observation		
	Abstract conceptualisation	Analysing Creating theories to explain observations	Use lectures, present papers, and analogies
Convergers	Abstract conceptualisation		
	Active experimentation	Doing things Using experiments to solve problems Working on projects	Small group discussion Offer simulations, case studies, and homework

Sources: Kolb, 1984; Litzinger and Osif, 1992; Hartman, 1995.

Honey and Mumford's learning styles model

Honey and Mumford (1982) identified four types of learners as activist, reflector, theorist and pragmatist, as summarised in Table 1.5.

TABLE 1.5 HONEY AND MUMFORD'S LEARNING STYLES MODEL

LEARNER TYPE	LEARNING STYLE OR PREFERENCE
Activist	• Likes challenges • Prefers new experiences • Likes problem solving • Likes hands-on doing things • Experimenting
Reflector	• Prefers structured learning • Likes to be given time to think • Reflecting • Observing • Watching
Theorist	• Logical analysing • Rational processing • Coming up with own ideas and theories • Clear aims and objectives • Well articulated learning outcomes • Needs to be given time to explore ideas • Looks for opportunities to question • Opportunities to stretch imagination and intellect

LEARNER TYPE	LEARNING STYLE OR PREFERENCE
Pragmatist	• Practical learning activities • Experimenting • Immediately relevant experiences • Practicing • Apply theory to real life contexts • Relating to emotions and feelings

Source: Honey and Mumford, 1982.

A comparison of the Wolf-Kolb model with the Honey-Mumford model shows a close similarity. The activist learner in the Honey-Mumford model has learning preferences similar to those of Wolf-Kolb's accommodators, who demonstrate ability and preference for active experimentation. Honey-Mumford's reflector aligns well with Wolf-Kolb's reflective observer, and the theorist matches the abstract conceptualiser. This means the teaching strategies given in the Wolf-Kolb model can also be used to facilitate learning of the different learning styles proposed in the Honey-Mumford model.

Taxonomies of cognitive processing

Many scholars have designed cognitive structures or logical frameworks to help educators understand how children acquire and develop new knowledge, understanding and skills, and therefore be better informed on how they can facilitate their children's learning. These theoretical frameworks consist of classifications of levels or aspects of learning and are generally referred to as taxonomies for cognitive processing or learning. This section outlines four important frameworks: Bloom's cognitive taxonomy, Fink's significant learning taxonomy, the SOLO taxonomy and Gardner's multiple intelligences.

Bloom's cognitive taxonomy

Bloom's (1956) taxonomy is one of the most widely used classifications of cognitive processes. It was developed by a team of cognitive psychologists at the University of Chicago led by American educational psychologist Benjamin Samuel Bloom (1913–99), and was first published in 1956 as *Taxonomy of Educational Objectives: Handbook* (Bloom, 1956).

As shown in Figure 1.2, in its original version Bloom's taxonomy identified three dimensions: the cognitive, knowledge based dimension; the affective, attitudinal based dimension; and the psychomotor, skills based dimension. These dimensions comprised six cognitive levels, five attitudinal levels and

FIGURE 1.2 BLOOM'S TAXONOMY: THE ORIGINAL AND REVISED VERSIONS

ORIGINAL BLOOM'S TAXONOMY				REVISED BLOOM'S TAXONOMY			
Three main dimensions		1	Cognitive: Knowledge based	Two main dimensions		1	Knowledge based
		2	Affective: Attitude based			2	Cognitive processes based
		3	Psychomotor: Skills based				
The six cognitive levels			***Nouns***	The six cognitive levels renamed and reordered			***Acting Verbs***
	Low	1	Knowledge		Low	1	Remembering
		2	Comprehension			2	Understanding
		3	Application			3	Applying
	High	4	Analysis		High	4	Analysing
		5	Synthesis			5	Evaluating
		6	Evaluation			6	Creating

six skills levels, respectively (Anderson et al., 2001). Of the three original dimensions, the cognitive dimension has had the greatest application in education. It was divided into six cognitive levels of hierarchical complexity. The lower cognitive levels (1–3) were identified as knowledge, comprehension and application. The higher cognitive levels (4–6) were called analysis, synthesis and evaluation.

In 2001, Bloom's taxonomy was revised by Anderson et al. (2001), and several changes were made based on feedback and experiences in schools. First, the three dimensions were reduced to two and renamed as shown in Figure 1.2. Second, all the six cognitive levels were renamed as acting verbs rather than nouns. Third, the lowest level of the original model was changed from knowledge to remembering. Fourth, comprehension and synthesis were renamed understanding and evaluating, respectively. Fifth, synthesis became the highest level and was renamed creating. Sixth, evaluation lost its highest ranking to become the second highest. Figure 1.2 presents the original and the revised versions side by side to help you appreciate the changes that were made and to understand the structural components of the revised model.

The revised model is outlined in Table 1.6. Here the knowledge dimension is divided into four knowledge domains: factual knowledge; conceptual knowledge; procedural knowledge; and metacognitive knowledge. The cognitive processes

dimension comprises the six cognitive levels: remembering; understanding; applying; analysing; evaluating; and creating. To help you understand how to use this taxonomy in your teaching, for example, by setting children activities which draw on the different knowledge dimensions at the different cognitive processing levels, Table 1.6 shows examples of twenty-four learning activities.

TABLE 1.6 LEARNING ACTIVITIES APPLYING BLOOM'S TAXONOMY

THE KNOWLEDGE DIMENSION	THE COGNITIVE DIMENSION						
	Remembering	**Understanding**	**Applying**	**Analysing**	**Evaluating**	**Creating**	
Factual knowledge	List	Summarise	Use	Order	Check	Combine	Learning activities
Conceptual knowledge	Describe	Interpret	Experiment	Explain	Assess	Plan	
Procedural knowledge	Tabulate	Classify	Calculate	Organise	Conclude	Compose	
Metacognitive knowledge	Demonstrate appropriate use	Explain	Execute	Achieve	Critique	Generate	

Source: Based on Anderson et al., 2001, pp. 46–68.

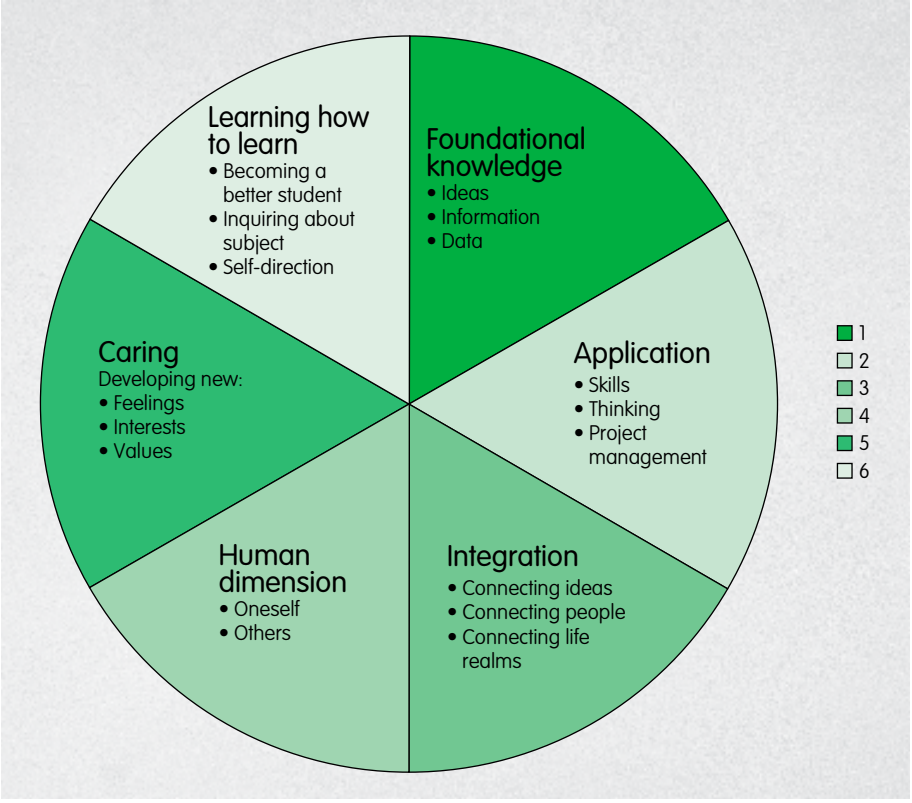
Fink's significant learning taxonomy

Dr Lee Fink (2003) argued that whereas teachers have used Bloom's taxonomy effectively, both for formulating course objectives and evaluating student learning, it did not show some important kinds of learning, such as learning how to learn, leadership, interpersonal skills, ethics, communication skills, character, tolerance and the ability to adapt to change. Fink argued that lasting change was needed to bring about significant learning. He accordingly set about developing a taxonomy which would identify lasting change that is important to the learner, described by Fink as significant learning (Fink, 2003). Fink's taxonomy of significant learning identified six kinds of significant learning, which he presented in a pie graphic organiser as illustrated in Figure 1.3.

In their review of Fink's significant learning taxonomy, Bell and Kahrhoff (2006, p. 6) offer the following enlightening summary.

1 *Foundational knowledge*: The basics, what students bring to the table.
2 *Application*: Doing; such as playing the piano, managing a complex task.

FIGURE 1.3 FINK'S SIGNIFICANT LEARNING TAXONOMY



3 *Integration*: When students are able to see and understand the connections between different things, an important kind of learning has occurred.
4 *Human dimension*: Relates the learning to the learner. This kind of learning informs students about the human significance of what they are learning.
5 *Caring*: When students care about something, they then have the energy they need for learning more about it and making it a part of their lives. Without the energy for learning, nothing significant happens.
6 *Learning how to learn*: This kind of learning enables students to continue learning in the future and to do so with greater effectiveness.

Fink (2003) argued that these six types of learning are the key to significant learning and the presence of any one, or multiples of them, represents significant learning. The more these types of learning occur in any learning experience, the more significant the learning is. Therefore, if you designed activities which gave your students all six types of experiences, that would give them the opportunity to engage in the most significant kind of learning, leading to lasting change that would represent deep learning and authentic

life experiences. Although compartmentalised in the pie chart, these learning styles are interconnected, relational and interactive; and unlike those in Bloom's taxonomy, they are not hierarchical.

The SOLO taxonomy

SOLO is the acronym for structure of the observed learning outcomes. It was designed by Biggs and Collis (1982) to provide a taxonomy that can be used to facilitate teaching, learning and assessment by incorporating both quantitative as well as qualitative aspects of the learning process. To include aspects of quality learning in their taxonomy, Biggs and Collis focused on the type of connections that students make as they engage with a learning task. The more the learner shows connections of increasing complexity among ideas and integrates facts, concepts, skills and strategies, the higher the quality of the student's learning.

Following this reasoning they identified five stages of learning: 1 pre-structural; 2 unistructural; 3 multistructural; 4 relational level; 5 extended abstract level. They postulated levels of increasing complexity across these stages as illustrated in Table 1.7. Included in the table are the types of connections associated with each structural level, the type of learning activities that would represent that level of connection and the quality of learning the connections would result in.

TABLE 1.7 THE SOLO TAXONOMY ELABORATED

LEARNING STAGE	LEARNING CONNECTIONS	TYPICAL TYPE OF LEARNING ACTIVITY	CONCOMITANT QUALITY OF LEARNING
Pre-structural	Acquires pieces of unconnected information	Name [May be] Gather [May be] Spot [Perhaps] Label [May be] [*Really none*]	No knowledge Have no sense of understanding No engagement with learning Stage of ignorance
Unistructural	Makes some simple and obvious connections ***Obvious connections: Quantitative in nature***	Identify Memorise Recite Define Arrange Enumerate Reproduce	Surface learning No understanding of the significance of the connections Basic facts No use of organising principle Understand one aspect of topic

(*continued*)

TABLE 1.7 (*CONTINUED*)

LEARNING STAGE	LEARNING CONNECTIONS	TYPICAL TYPE OF LEARNING ACTIVITY	CONCOMITANT QUALITY OF LEARNING
Multistructural	Makes a number of connections within the data ***Some meaningful connections: Mainly quantitative in nature***	Enumerate Tabulate Classify Describe Complete Solve Prove	Surface learning Connections articulated but significance of embedded relationships not demonstrated
Relational level	Demonstrates relationships among connections ***Some meta-connections: Mainly qualitative in nature***	Compare Contrast Explain Apply Analyse Design Argue Conclude	Understands relationships among the connections and how they relate to the whole
Extended abstract level	Makes connections above and beyond the immediate topic or subject area ***Qualitative aspects extended across key learning areas and curricula***	Modify Generalise Create Generate new knowledge Predict Critically reflect Evaluate	Able to generalise and transfer learning to similar and new contexts Can theorise and develop hypotheses

Source: Biggs and Collis, 1982.

Gardner's multiple intelligences

One of the most well known and widely used leaning taxonomies is Gardner's (1983) taxonomy of multiple intelligences. Howard Gardner, an American developmental psychologist, challenged the psychological view that intelligence was a single entity that could be measured by an intelligence quotient (IQ), and instead proposed that every individual has many, discrete intellectual capacities called multiple intelligences. In his original taxonomy, first published in *Frames of Mind: The Theory of Multiple Intelligences* (Gardner, 1983), and which was intended primarily for use in psychology, he identified six multiple intelligences. Following further evidence from brain research, research on human development,

evolution and cross-cultural comparisons, he increased this number to eight and more recently a ninth and tenth have been added (Gardner, 1999; 2006; 2013). His current taxonomy is summarised in Table 1.8.

TABLE 1.8 HOWARD GARDNER'S TAXONOMY OF MULTIPLE INTELLIGENCES

NAME OF MULTIPLE INTELLIGENCE	BRIEF DESCRIPTION OF EACH INTELLIGENCE
Verbal-linguistic intelligence	Well-developed verbal skills and sensitivity to the sounds, meanings and rhythms of words.
Logical-mathematical intelligence	Ability to think conceptually and abstractly, and capacity to discern logical and numerical patterns.
Spatial-visual intelligence	Capacity to think in images and pictures, to visualise accurately and abstractly.
Bodily-kinaesthetic intelligence	Ability to control one's body movements and to handle objects skilfully.
Musical intelligence	Ability to produce and appreciate rhythm, pitch and timber.
Interpersonal intelligence	Capacity to detect and respond appropriately to the moods, motivations and desires of others.
Intrapersonal Intelligence	Capacity to be self-aware and in tune with inner feelings, values, beliefs and thinking processes.
Naturalist intelligence	Ability to recognise and categorise plants, animals and other objects in nature.
Existential intelligence	Ability to tackle the most fundamental questions about human existence; such as: Why do we live? What's the meaning of life? Where do we come from? Why do we die? What is love? Why do we make war?
Pedagogical intelligence	Ability to convey knowledge or skills to other people.

Source: Gardner, 1983; 1999; 2006; 2013.

Gardner's taxonomy has made great contributions to pedagogy and our understanding of intelligence. In his own words, Gardner (2013, p. 3) says:

> since human beings have their own unique configurations of intelligences, we should take that into consideration when teaching, mentoring or nurturing. As much as possible, we should teach individuals in ways they can learn and we should assess them in a way that allows them to show what they have understood and to apply their knowledge and skills in unfamiliar contexts.

Apart from calling for individualisation of teaching, learning, assessment and curriculum as embedded in this quote, Gardner's second significant proposition for education, arising out of his taxonomy is, again in his own words:

> a call for teaching consequential materials in several ways. [Whatever subject you are teaching], … you should decide which ideas are truly important and then you should present them in multiple ways. [This way] … you achieve two important goals. First, you reach all students, … and second, you show what it is like to be an expert. (Gardner, 2013, p. 3)

Instructional models of learning

Many instructional models have been developed to scaffold children's construction of knowledge, and this section outlines some of these.

BSCS/Bruner's 5E instructional model

The 5E instructional model was developed by Rodger W. Bybee (Bybee et al., 2006) in collaboration with six science colleagues at Colorado Springs Biological Science Curriculum Study (BSCS) Educational Centre. They postulated that to maximise students' active learning and construction of knowledge, they should be given opportunities to be involved in five key elements of active learning, namely: engage; explore; explain; elaborate; and evaluate.

The 5E instructional model is a learning cycle based on the constructivist view of learning, with each of the 5Es describing a phase of involvement which seeks to maximise active learning by the student. Outside science, this model was applied and made popular in pedagogy by Jerome Bruner (1966). Table 1.9 summarises the 5E instructional model and provides some examples of teaching strategies and student activities that you could use to facilitate teaching and learning in each phase of the model.

TABLE 1.9 THE BSCS/BRUNER 5E INSTRUCTIONAL MODEL

5E LEARNING PHASE	TEACHING STRATEGIES	STUDENT ACTIVITIES
Engage Introduce topic Link with prior learning Set expectations Set learning goals Set learning outcomes	• Peak students' interest and attention to promote personal engagement • Question to access learner's prior knowledge, with 'why' and K-W-H-L strategies • Mind map • Apply motivational strategies • Arouse curiosity and encourage participation • Explain and guide inquiry • Clarify and focus on learning outcomes	• Connecting schema to new knowledge • Alert, attentive, listening and questioning • Mentally engaged • Interested participation • Inquisitive • Responding to questions • Raising own questions

5E LEARNING PHASE	TEACHING STRATEGIES	STUDENT ACTIVITIES
Explore Venture into new areas Inquire, probe, investigate Metacognition Understand relationships	• Guide investigation into new area • Facilitate individual and team work • Identify and correct misperceptions • Monitor, listen and observe student activities and probe as needed • Scaffold as needed • Encourage reflection • Allow sufficient time for exploration	• Experimenting • Internet searches • Positive interdependence • Individual accountability • Active listening • Gathering data, observing and recording • Discussion
Explain Demonstrate understanding Link past to new knowledge Use new terms	• Question and probe for explanation • Explain new terms discovered by students • Reinforce students' contributions • Look for the conceptual exceptions • Look for and investigate patterns in data • Whole-class discussion, student-led • Cooperative learning strategies	• Stating their understanding • Describing findings • Comparing • Contrasting • Equal participation • Explaining to peers • Interpreting findings in data
Elaborate Deeper/broader explanation Extend knowledge Use formal language	• Challenge conceptual understanding • Opportunities for deeper and broader understanding of new concepts • Opportunities to practise and apply skills learnt • Telegraph new areas to move into • Encourage venturing into new areas	• Applying new knowledge • Delving deeper into concepts already learnt • Trying out new skills • Using new terminology • Raising many new questions
Evaluate Reflect on learning Assess understanding See significance of learning to real-life situations Demonstrate mastery	• Provide feedback • Formative and summative assessment • Whole-class discussion • Group presentations to class • Observe students' presentations • Monitor mastery of concepts covered • Recognition of knowledge and skills learnt • Provide recapitulation of learning outcomes and link to next lesson • Provide synthesis of learning that has occurred and its significance in subject and across KLAs	• Self-assessment • Peer assessment • Questioning and answering questions to demonstrate understanding • Open-ended extended responses • Linking learning to forthcoming learning

Sources: Barufaldi, 2002, p. 1; Bybee et al., 2006, p. 1; Jobrack, 2013, pp. 1–8.

Although the 5E instructional model was developed primarily to assist science teachers, it is highly applicable to an understanding of how children, students and adults learn at all cognitive levels (Bruner, 1966). Within the five easily memorable words are embedded activities and learning processes that lie at the very foundation of constructivist teaching and learning. For example, each of the 5Es puts the responsibility for knowledge construction in the hands of the learner, not the teacher (Piaget, 1950; Vygotsky, 1978). The model can be an excellent structure for lesson plans that maximise student participation in their construction of knowledge.

De Bono's Six Thinking Hats model

With his Six Thinking Hats, Edward de Bono (1956) developed a simple but effective system to facilitate teaching and learning. De Bono (1992, p. 8) says that when we attempt practical thinking, we face three fundamental problems: 'emotions, helplessness and confusion'. The Six Thinking Hats is a metaphor to represent six different cognitive approaches to understanding and solving whatever problem is encountered. The six hats are coloured Red, White, Yellow, Black, Green and Blue, with each hat representing a different logical and philosophical approach to learning and problem solving. Using the model, learning or understanding or solving a problem can be approached from different perspectives, with each perspective represented by its own coloured metaphorical thinking hat, thus utilising *emotions* correctly, identifying clear steps that we can take so we overcome the *helplessness*, and do one thinking at a time so that we avoid *confusion*. Table 1.10 summarises the conceptual meaning of each hat and offers examples of activities that can be used with primary children to facilitate their learning and problem solving.

When using the hats, none is better than the other. Each is just a different approach to learning and understanding. In particular, the black hat is not a bad hat. As children switch hats, they improve their critical-thinking skills and engage in deeper thinking about the concept they are learning or problem they are solving. This model encourages children to learn in a colourful and fun, easy way. As the children wear the different hats, whether individually or as a cooperative learning team, they use their hat as a framework for organising their thinking in a more focused and constructive way. Because they wear one hat at a time, they learn to focus on one important aspect at a time, and thus avoid confusion as they take charge of their learning.

TABLE 1.10 EDWARD DE BONO'S SIX THINKING HATS AND HOW TO USE THEM

COLOURED HAT AND MEANING	EXAMPLES OF LEARNING ACTIVITIES OR GUIDING QUESTIONS
Red Hat Worn to express thinkers' real feelings, emotions, hunches and intuition. Intense and gentle feelings expressed without fear or explanation at this moment in time; and without demanding they be shared.	• Say what you like about this idea. • Express your feelings about … • What don't you like about this character? • Are you certain about …? • What do you find interesting about …? • What are the exciting aspects in this story? • What do you find boring? • Which one do you prefer? What are the choices? • What is your assessment of?

COLOURED HAT AND MEANING	EXAMPLES OF LEARNING ACTIVITIES OR GUIDING QUESTIONS
White Hat Worn to share information known or find new data needed. Neutral, objective. No arguments, suggestions or feelings. Exclusive focus on information.	• What information do we have about this? • What information do we need to complete this task? • Never mind the arguments: What is the information here? • Where does this information come from? • Is it relevant to this activity? • What other information do we need? • Do we have enough information to make a decision? • What do we already know about this topic? • How many members of the animal kingdom are there?
Yellow Hat Worn to symbolise optimism, sunshine, bright side of things. Must be logical and supported with reasons: not just hope. Not a random suggestion. Benefits from action; even though not certain about future.	• What do you see as the good points in this? • Can you explain the benefits associated with …? • Why do you think that idea will help solve the problem? • What value do you see in this? • What can you do to make this work? • What is the likelihood that this will succeed? • How else could this be improved? If cars could be driven by voice command, what would the benefits be? • If humans had three hands what would the benefits be?
Black Hat Worn to signify caution and critical thinking. Reasons why something may not work. Not a bad hat.	• What's the evidence? Is this fair? • What is the logic behind this? • Is this feasible? Why might this plan not work? • Does this fit or serve the purpose? • What might go wrong? What are the weaknesses?
Green Hat Worn to focus on creativity, new ideas and possibilities. Lateral thinking. Energetic and abundance. Creative.	• Let's suppose this happens, what could be the consequence? • What if he was given an interview …? • What can you suggest to improve on this? • Why is this an interesting idea? • We appear bogged down here: What might be a way out? • What uses can you suggest for a talking wristwatch?
Blue Hat Worn to manage the thinking process. Thinking about thinking. Organising and control thinking process to become more productive. Not about the subject, but about thinking. Metacognitive hat. Overview of thinking process. 'Orchestra conductor' metaphor. Provide an agenda. Define and restate objectives. Decide next step. Provide summary. Conclude.	• Here are some alternative views to start exploring this idea. • Can you explain how you reached that conclusion? • What are we trying to achieve and how shall we get there? • What outcomes should we aim for and how shall we achieve them? • How about examining each of the steps and considering its implications? What have we got so far? • What plan or strategy would enable you to complete …? • In organising a menu for a party that will include vegetarians, what thinking steps would you use to complete this task?

Source: De Bono, 1992, pp. 30–112.

classroom activity 1.2 APPLYING TAXONOMY MODELS TO PRACTICE

Here are two activities to help you practise teaching children using Bruner's, Bloom's, Gardner's and De Bono's models.

1 Using the matrix below, design a series of activities for a named primary stage that would match each of Bruner's 5Es to Bloom's revised taxonomy.

BLOOM'S REVISED TAXONOMY							
		Remembering	Understanding	Applying	Analysing	Evaluating	Creating
Bruner's 5Es	Engage						
	Explore						
	Explain						
	Elaborate						
	Evaluate						

2 Using the matrix below, design a series of problem-solving activities for a named, upper primary stage you could give children to work with Gardner's and De Bono's models.

	RED HAT	WHITE HAT	YELLOW HAT	BLACK HAT	GREEN HAT	BLUE HAT
Verbal-linguistic intelligence						
Logical-mathematical intelligence						
Spatial-visual intelligence						
Bodily-kinaesthetic intelligence						
Musical intelligence						
Interpersonal intelligence						
Intrapersonal Intelligence						
Naturalist intelligence						

BEST PRACTICE PEDAGOGY AND ACTIVE LEARNING IN AUSTRALIAN CONTEXTS

In this section, the concept of active learning will be considered, to develop a better understanding of its importance and significance in pedagogy. Scholars have defined **active learning** in many different ways, but two descriptions that appear to capture its meaning well are provided by Bell and Kahrhoff (2006) and Bonwell and Eison (1991). Bell and Kahrhoff (2006, p. 1) say 'Active Learning is a process wherein students are actively engaged in building understanding of facts, ideas, and skills through the completion of instructor directed tasks and activities'. Similarly, Bonwell and Eison define active learning as any instructional method that engages students in doing things and thinking about what they are doing. This means that active learning involves both doing and reflecting upon what is being done. The central understanding is that in active learning, students are the focus of what happens in the classroom and they *do* actively engage in the activities that take place so as to construct their own understanding of what they are learning. This focus on students *doing* something and participating in their own knowledge discovery is what makes active learning the focal point of the constructivist model of learning. It clearly sets it apart from the passivity of learners in the transmission and tabula rasa models of learning.

Active learning
A process in which students are actively engaged in building understanding of facts, ideas and skills through the completion of instructor directed tasks and activities.

Through active listening, answering and raising questions, and participating in any practical activity organised in class, active learners are better able to link their schema of prior learning to the new knowledge they are exposed to in class and make sense of it, through assimilation, accommodation or adaptation (Piaget, 1954), and is better able to construct meaning (Vygotsky, 1978), internalise knowledge and develop a deep understanding of ideas. Chickering and Gamson (1987, p. 3) articulate this very well when they say:

> Learning is not a spectator sport. Students do not learn much just sitting in class listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves.

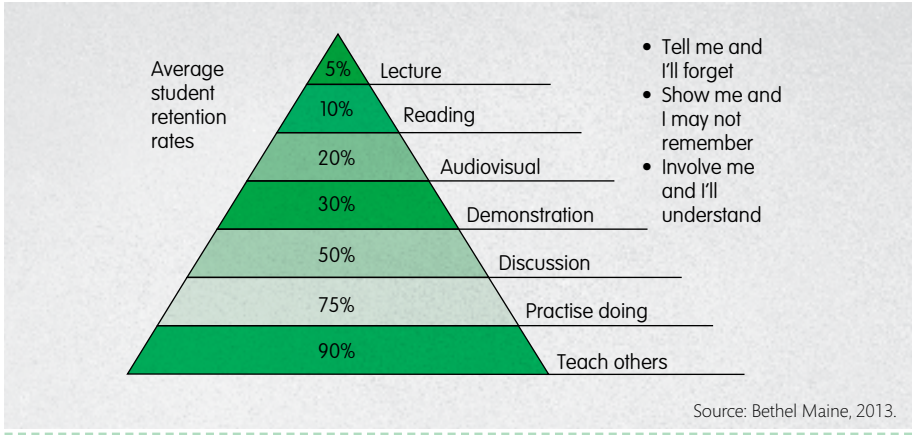
Thus, although listening or simply reading in class is doing something, it is not active learning. Active learning involves discovering, processing, applying, analysing, evaluating and creating new knowledge. These are the higher-order thinking levels in Bloom's cognitive taxonomy; they enable deep rather than surface learning, and the learner retains more of the meaningful ideas. Active learning is therefore more effective learning. As Smith et al. (2005, p. 2) correctly assert,

when children are engaged in active learning, the teacher 'becomes less of an imparter of knowledge and more a designer and facilitator of learning experiences and opportunities'. There is a partnership between you and your students.

Theoretical framework for active learning

To demonstrate the greater effectiveness of active learning strategies compared to transmission strategies, some writers at the National Training Laboratories (Bethel Maine, 2013) have graphically illustrated the average retention rates presumably experienced among students taught by the different approaches. They theorise that these average retention rates could be illustrated in what they call the Learning Pyramid (illustrated in Figure 1.4), following Edgar Dale (1900–85).

FIGURE 1.4 THE LEARNING PYRAMID



Source: Bethel Maine, 2013.

Although this Learning Pyramid is not a scientifically proven model, it helps conceptualise the desirability of active learning teaching strategies rather than transmission strategies in a more effective integrated pedagogy. You should not pay attention to the exact percentages in the model because these have never been documented or evidenced by research data (Atherton, 2010). We know, for instance, that children learn differently and that factors such as motivation, mental transformation and manipulation of learning materials, the learning context and how the strategies align with the learners' learning preferences, their learning stages and the teacher, all play a part. Despite the absence of scientific evidence, general abstraction from the model is supported by research evidence showing that the value of active learning is well known. For example, Nelson

(2010, pp. 122–3) synthesised the results in a comprehensive study that compared traditional transmission teaching with classes taught using active/cooperative learning strategies and concluded that 'students taught through active group-work learned two to three times more than students taught through traditional lecture methods'.

Further research support for this model is provided by Prince (2004, p. 5) who concluded that: 'In summary, considerable support exists for the core elements of active learning. Introducing activity into lectures can significantly improve recall of information'. The general message in the model is reinforced further by Michael (2006, p. 165), who found that: 'There IS [his emphasis] evidence that active learning, student-centred approaches to teaching physiology work, and they work better than more passive approaches'. Additionally, the work of Springer, Stanne and Donovan (1999) resulted from a comprehensive meta-analysis of small-group learning in the sciences which found that small-group learning activities were effective in promoting greater academic achievement, more favourable attitudes towards learning and increased persistence in the science subjects involved (Millis, 2012, p. 2).

Berry (2008) also lends support to the implications of this model when he postulates that all active learning involves the following four processes:

1 critical thinking
2 individual responsibility for learning
3 involvement in open-ended activities
4 organisation of learning activities by the teacher.

Millis (2012) says that critical thinking can be promoted through the use of tasks involving higher-order cognitive levels as proposed by Bloom (1956). This discussion is enriched by Brookfield (1987) who proposes that critical thinking happens when students find their assumptions challenged and see alternative ways of approaching problems. For this reason, cooperative learning strategies are seen as having a high potential for promoting active learning (see also Chapter 9). We will now consider what active learning looks like in the classroom.

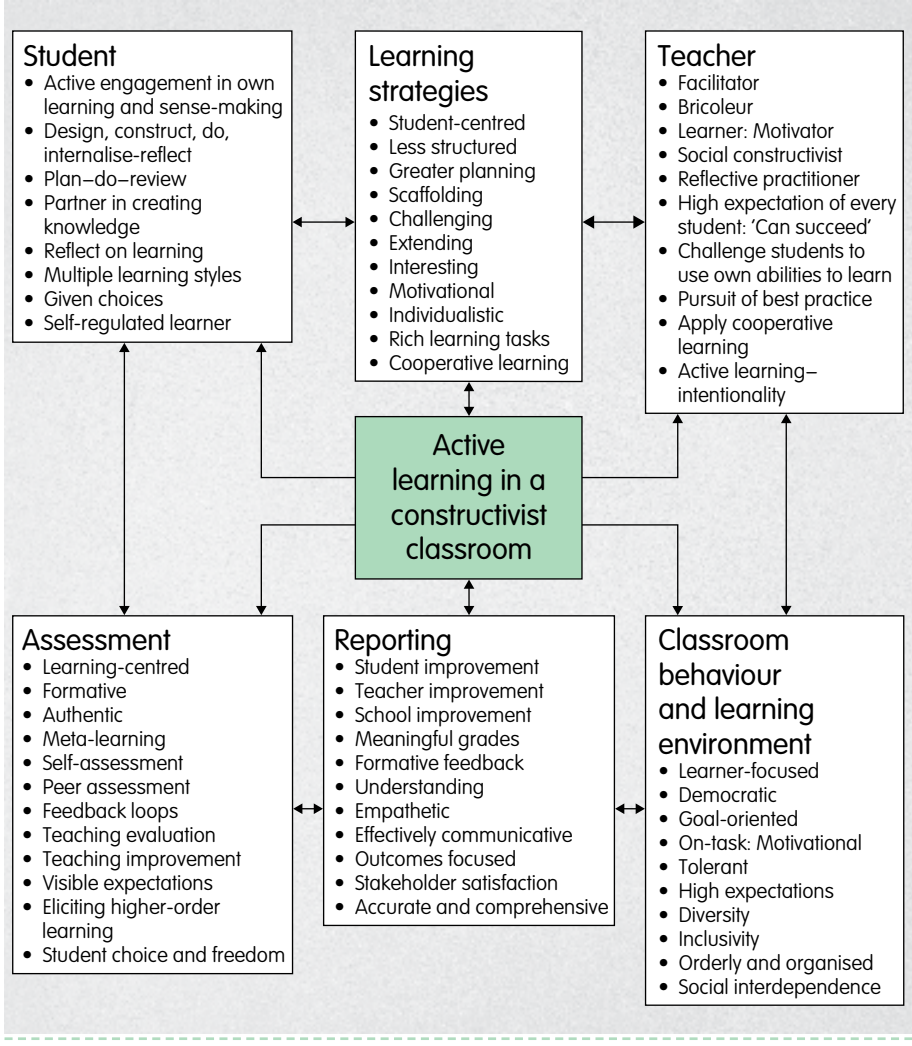
TEACHING AND LEARNING IN A CONSTRUCTIVIST CLASSROOM

Engaging your students in constructivist active learning activities means there is no limit to the range of teaching techniques that you can apply. You can plan to engage your students in individual activities and reflection, or to work in pairs or in a variety of cooperative learning structures. Guided by activities and strategies

that have helped my students learn over my many years in classrooms, and informed by my reflection on how my students are experiencing their learning and perceiving my teaching (Brookfield, 2006, p. 17), I have designed a model that represents what teaching and learning look like in a constructivist classroom, illustrated in Figure 1.5.

As synthesised in Figure 1.5, a constructivist classroom within which active learning is taking place is a highly dynamic context. For example, students are busy, and actively engaged in constructing their own understanding. Learning strategies are student-centred, providing scaffolding comprising of rich learning tasks and cooperative learning teams. The teacher is less important than

FIGURE 1.5 A MODEL OF TEACHING AND LEARNING IN A CONSTRUCTIVIST CLASSROOM



the students, and is a multi-talented, facilitating, self-reflecting practitioner. The classroom environment and behaviour are goal-oriented and on-task, with high expectations of every student by the teacher. Assessment is for learning and is authentic. And reporting is primarily designed for student improvement. These processes are all interrelated in a dynamic *quality-learning environment* that plans and facilitates *intellectual quality learning* in which children are engaged in the construction of deep knowledge and understanding of ideas, concepts, issues and skills that have *significance* in their lives at school and beyond school (the italics emphasise the three dimensions of the NSW Quality Teaching Model; see NSW DET, 2003). In the words of Carnes (2011, p. 72), in a classroom in which constructivist active learning is taking place, children 'attend classes that set their minds on fire'.

A good picture of your role as a teacher in a classroom where constructivist active learning is taking place is painted vividly by 2000 Businesswomen's HALL OF FAME inductee Julie Boyd (2013, p. 3) when she says the:

> … teacher is like a great artist. Someone who is able, through their chosen profession to inspire both students and peers to learn lifelong. Someone who is able to achieve the right balance in the choices they make in the learning opportunities and challenges they create. Someone who is able to put together a sometimes eclectic group of tools and strategies to achieve the 'light bulb flash' learning moment as well as sustained interest in learning individually, in small groups or whole classes, for one student or an entire class.

She says it means having at your disposal:

1. An understanding of how people learn
2. A clear view of how learning and behaviour interact
3. A repertoire of strategies on which to draw appropriately in different situations
4. An awareness of the attitudes and values you hold about students and learning
5. A 'principle-centred' approach to teaching and learning
6. A capacity to make learning challenges relevant
7. An understanding of how to provide learning experiences and challenges which are multi-sensory, multimodal and multi-styled
8. A capacity to articulate learning across a range of face to face and digital learning environments
9. An ability to assist students to monitor and evaluate their own learning both formally and informally
10. A sophisticated and contemporary view of the role of teachers in the lives of young people
11. A will to have a positive impact on young people.

THE ROLE OF AUSTRALIAN CORE VALUES IN AN INTEGRATED PEDAGOGY

Whatever model of learning you choose to apply in your pursuit of best practice pedagogy, it should reflect consistency with what matters to your students as individuals and what they want to aspire to as Australians. This will apply to all contexts, and is the focus of societal values. Michael Sowey (2013, p. 1) defines societal values as 'the assumptions, beliefs or principles that guide people's decision-making and actions in society'. The Australian Department of Education, Science and Training (DEST, 2005, p. 4) says the 'shared values, such as respect and "fair go" are part of Australia's common democratic way of life, which includes equality, freedom and the rule of law'. It presents the *National Framework for Values Education in Australian Schools*, which was unanimously supported by all Ministers of Education at the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA). MCEETYA:

- acknowledged that education is as much about building character as it is about equipping students with specific skills;
- noted that values based education can strengthen students' self-esteem, optimism and commitment to personal fulfillment; and help students exercise ethical judgment and social responsibility; and
- recognized that parents expect schools to help students understand and develop personal and social responsibilities. (DEST, 2005, p. 1)

The nine Values for Australian Schooling that were agreed on by all jurisdictions in the Australian education context are given by DEST (2005, p. 4) as follows:

1. Care and Compassion: Care for self and others
2. Doing Your Best: Seek to accomplish something worthy and admirable, try hard, pursue excellence
3. Fair Go: Pursue and protect the common good where all people are treated fairly for a just society
4. Freedom: Enjoy all the rights and privileges of Australian citizenship free from unnecessary interference or control, and stand up for the rights of others
5. Honesty and Trustworthiness: Be honest, sincere and seek the truth
6. Integrity: Act in accordance with principles of moral and ethical conduct, ensure consistency between words and deeds
7. Respect: Treat others with consideration and regard, respect another person's point of view
8. Responsibility: Be accountable for one's own actions, resolve differences in constructive, non-violent and peaceful ways, contribute to society and to civic life, take care of the environment

9 Understanding, Tolerance and Inclusion: Be aware of others and their cultures, accept diversity within a democratic society, being included and including others.

Teaching these values gives you and your students the opportunity to contribute to Australia's *National Goals for Schooling in the Twenty-First Century*, which according to the Adelaide Declaration (MCEETYA, 1999) recognises that:

> Australia's future depends upon each citizen having the necessary knowledge, understanding, skills and *values* [author's emphasis] for a productive and rewarding life in an educated, just and open society. High quality schooling is central to achieving this vision … Schooling provides a foundation for young Australians' intellectual, physical, social, moral, spiritual and aesthetic development.

SUMMARY

We have seen in this chapter that learning is an active process and not something that can simply be given to a passive recipient. The concept of learning has exercised the minds of scholars over many centuries in their endeavours to provide answers to three fundamental questions: What is learning? What does it involve? And, how can teachers facilitate learning? This chapter has designed and presented the Best Practice Integrated Pedagogy (BPIP) model to help you develop a deep understanding of the concept of 'best practice pedagogy'.

The search for answers to questions about the nature of learning has led to the development of many models of learning, from the transmission mechanism model to the social constructivist model. Each of the models has made a useful contribution to an understanding of pedagogy, but the search for increased understanding of how teaching, learning, assessment and reporting are interrelated continues even today. This chapter asserts that teaching, learning, assessment and reporting are intimately interconnected in an integrated pedagogy and should be studied and analysed together. While the social constructivist model provides the dominant paradigm that has guided pedagogical practice in the twentieth century, research is needed to identify how the advances in digital technologies can be incorporated to make it more effective and relevant in twenty-first-century learning. This requires greater engagement with the connectivist model of learning.

Many other models, frameworks and taxonomies have also been developed to inform our professional practice. A good understanding of these can enhance best practice in an integrated pedagogy.

theorists in focus

JEAN PIAGET AND LEV VYGOTSKY

Constructivist theories of learning are identified most widely with the cognitive psychologists Jean Piaget (1923) and Lev Vygotsky (1978). These theories postulate that learners construct knowledge and meaning from their experiences. Vygotsky introduced the concept of zone of proximal development (ZPD) to emphasise that there is a gap between what individual learners can achieve on their own and what they can attain when their full potential is enhanced through support given by a more capable individual.

Vygotsky focused his intellectual development studies on the social environment of the child at about the same time that Piaget was focusing on the child's individual exploration and discovery, and produced what became known as the developmental theory of social constructivism, which has become the dominant theoretical model informing best practice pedagogy. Vygotsky's key proposition was that children's cognitive development is influenced most by people, especially parents, teachers and mentors in the child's social environment. He argued that it is the collaborative interactions between learners and members of their immediate society that enable learners to make meaning of their world in their cultural setting. He placed special emphasis upon the social world of the child and observed that a child's culture influences how the child thinks and develops cognitively. To emphasise this relationship he said: 'In the process of development, the child not only masters the items of cultural experience but the habits and forms of cultural behaviour, the cultural methods of reasoning' (Vygotsky, 1929, p. 415).

1 Both Piaget and Vygotsky are well-known cognitivist theorists. In reflecting on their theories, what do you see as the major differences between the two?
2 With regard to a class you have taught recently, are you able to identify different ways in which you applied constructivist principles?
3 Do you have your own theory of how children learn? Does it include reference to the social context of learning?
4 How does your own theory align with the social constructivist model of learning?
5 Why is it important to have a theory of learning?
6 What do you see as the implications of applying the social constructivist model in your teaching?
7 What opportunities does the development of digital social media create for improving the social constructivist model?

theorists in focus

8 Talk with your peers and discuss your responses to all these questions.

9 For a named primary learning stage and subject, prepare an outline for a Lesson Plan in which you would involve the children in activities reflecting the constructivist model.

10 Imagine your ideal classroom. For a named lesson and learning stage, how would you set it up to maximise the benefits of the constructivist model?

ONLINE RESOURCES AND ACTIVITIES

The following online videos provide ideas about active learning in the classroom.

- Understanding what active learning is and what it involves [4:13 minutes]
  www.youtube.com/watch?v=UsDI6hDx5uI
- Active learning, the learning pyramid and Bloom's taxonomy [3:35 minutes]
  www.youtube.com/watch?v=dwxmPrBdIcQ
- What does active learning look like in the classroom? [5:33 minutes]
  www.youtube.com/watch?v=H7xidmVt0uE
- How do you set up a classroom for active learning and utilise technology? [3:38 minutes]
  www.youtube.com/watch?v=IfT_hoiuY8w
- Dr David Felder on the merits of active learning and how to implement it [11:44 minutes]
  www.youtube.com/watch?v=1J1URbdisYE-
- Active learning with Emeritus Professor Mel Silverman [6:01 minutes]
  www.youtube.com/watch?v=GQAnIyYLtZk

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