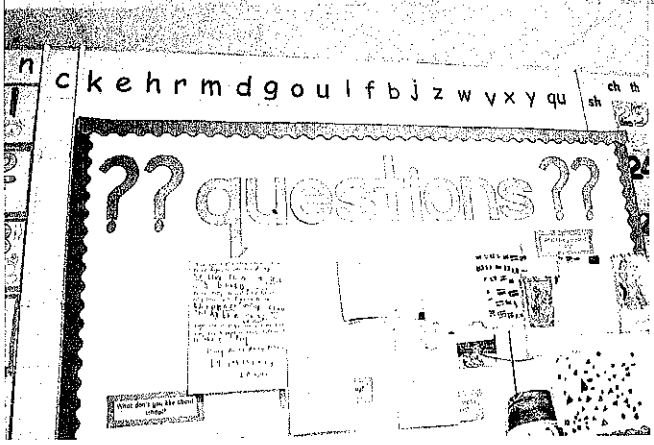
Pedagogy, teaching and learning



Source: Jules Selmes. Pearson Education Ltd.

INTRODUCTION

'Pedagogy' is a term which has many meanings and perspectives, all related to particular practices of teaching and learning. Although pedagogy has referred in the past to traditional teaching and learning practices, it is evident that new communication technologies give teachers and students access to very different modes of working (Leach & Moon, 2008).

According to Teaching Australia (2008), pedagogy is defined as 'the art and science of educating children, the strategies for using teacher professional knowledge, skills and abilities in order to foster good learning outcomes' (p. 3).

Teaching and learning strategies used in schools reflect the preferences of teachers and students. It is crucial for teachers to match their preferences with student preferences and to be willing to be creative in exploring new, pedagogical opportunities.

PEDAGOGY

Shulman (1986) initiated considerable debate in the 1980s with his use of the phrase 'pedagogical content knowledge', and the importance of this knowledge for successful teaching. Shulman (1986) argued that pedagogical content knowledge consisted of a synthesis of three elements, namely:

- subject matter knowledge – 'deep' knowledge of the subject
- pedagogical knowledge – special knowledge of how to transfer knowledge in a comprehensible form to others
- knowledge of context – understanding of learner needs and local school environment (see Figure 11.1).

These are important elements which may not be fully developed by pre-service teachers (Shulman & Shulman, 2009). For example, Darling-Hammond (1994) notes that many pre-service courses do not provide opportunities for deep subject matter study, while Rahman and Scaife (2005) conclude from their study that pre-service teachers have difficulty applying pedagogical knowledge.

Pedagogical content knowledge is unique to teachers and separates a specialist teacher from someone working in a similar field but outside of teaching. For example, Cochran, King, and DeRuiter

From Chapter 11 of *Marsh's Becoming a Teacher*, 6e, pp. 181–210. Colin J Marsh, Maggie Clarke, Sharon Pittaway.

(1991, as cited in Veal & MaKinster, 1999) differentiated between a teacher and a content specialist in the following manner:

> *Teachers differ from biologists, historians, writers, or educational researchers, not necessarily in the quality or quantity of their subject matter knowledge, but in how that knowledge is organized and used. For example, experienced science teachers' knowledge of science is structured from a teaching perspective and is used as a basis for helping students to understand specific concepts. A scientist's knowledge, on the other hand, is structured from a research perspective and is used as a basis for the construction of new knowledge in the field. (p. 5)*

Shulman (1992) developed a model of 'Pedagogical Reasoning' which, he argued, was essential for teachers to master. It consists of:

- comprehension – teachers need to understand subject matter structures, 'big' ideas, deep meanings
- transformation – teachers must be able to transform this content knowledge into forms that are pedagogically powerful and adaptive to student abilities
- instruction – teachers must perform various teaching and learning acts such as whole class presentations and organising student-centred activities
- evaluation – teacher must check students' understanding during and at the end of lessons
- reflection – teachers must review, reconstruct, re-enact and critically analyse their own teaching
- new comprehension – teachers will achieve new comprehension about pedagogical content knowledge through performing this cycle of activities.

Acquiring appropriate pedagogical content knowledge is a challenge for all teachers – it involves using the processes outlined above by Shulman (1992) which takes time, experience and the capacity

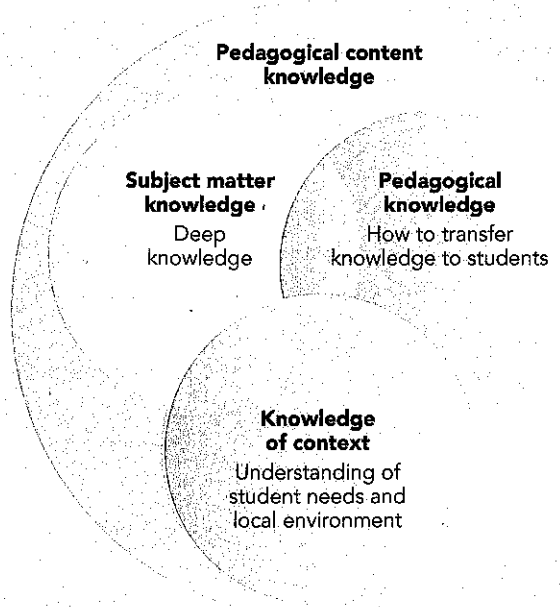


FIGURE 11.1 ● Pedagogical content knowledge

to reflect on practice. According to Leach and Moon (2008), if teachers are going to engage in *transformative* teaching and learning they need to understand the complex factors that influence the process of learning and teaching, and in particular understand and appreciate that:

- the mind is complex and multifaceted
- learning is a social process
- the development of knowledge is inseparable from the process of participating in a culture of practice
- teachers need to imaginatively consider the wide range of pedagogical tools and technologies available
- pedagogy must build the self-esteem and identity of learners
- pedagogic settings should create the conditions for reflection and dialogue.

Matching teaching styles with students' learning styles

Developing pedagogical content knowledge means that teachers must, among other things, have at their disposal a range of approaches to teaching and learning and a range of instructional strategies to call upon in particular situations. Instructional strategies are *research-based* tools that guide teachers in maximising student learning and achievement. Effective teachers will have the capacity to be flexible in their approach to teaching through their use of a wide range of strategies. Continual professional learning, collegial discussions and reflection are needed to ensure teachers are exposed to new approaches to teaching and determining the success of these approaches. Just a few approaches to teaching are listed in Table 11.1. A number are described in detail in this chapter.

Various authors, such as Dunn, Beaudry and Klavas (1989) and Hendry et al. (2005), contend that it is crucial for teachers to match up their teaching styles with students' learning styles.

Pause for thought

It can be difficult to identify students' learning styles. Do you have a particular learning style? How did you identify it, and when? Do you think your teachers were/are aware of your learning style? How might you begin to identify your own students' learning styles?

Slack and Norwich (2007) refer to the reliability and validity of Smith's (2001) student self-report inventory, which focuses on visual, auditory and kinaesthetic styles. Their study of 160 students in south-west England in Key Stage 2 mixed-age classes found that the visual and auditory scales were

TABLE 11.1 ● Overview of alternative instructional modes

- constructivist learning
- cooperative learning
- debates
- demonstrations
- direct instruction
- discussion
- field work
- independent study
- inquiry
- lectures and presentations
- learning centres
- mastery learning
- online learning
- oral reports
- practice drills
- project learning
- questioning
- simulations and role-plays
- small group brainstorming

directly related to learning mode preferences and concluded that the use of this inventory to match students' learning styles was a promising way of bringing about government policy on inclusive, differentiated and personalised learning.

Over to you

From your observations of students in a classroom, can you notice several different learning styles?

- **How would you label these learning styles?**
- **Do they seem to recur often with the same students or do they vary with the subject matter being taught?**

Another question to consider is: what encourages students to learn? Tomlinson and Germundson (2007) and McIntyre, Pedder and Rudduck (2005) contend that students seek an affirmation that they are significant in the classroom. As a consequence, matching factors (that is, matching the teacher's teaching style with students' learning styles) should be couched in terms of:

- students' acceptance in the classroom
- how safe they feel – physically, emotionally and intellectually
- how they consider people care about them and listen to them.

Morrison and Ridley (1988) use a similar argument when they suggest that teachers need to consider the following questions when matching their teaching to the ways students might learn:

- How is each student's self-concept being developed?
- How is each student's motivation being developed?
- How do teachers meet students' individual differences of need, interest, ability and skill?
- How do teachers develop individual learning styles and rates of learning?
- How is autonomy being developed in each student?
- How does the organisation of the class and school facilities foster security in each student?

McIntyre, Pedder and Rudduck's (2005) study of pupil voice concluded that pupils who offered ideas, where teachers responded to these ideas, were able to develop highly consensual views about learning – that is, by a process of interaction they developed a closer matching. Zembylas (2007) takes a similar stance with his emphasis on teachers and students developing emotional understanding of each other or of the subject matter they explore.

The other side of the equation is to consider the teaching styles of teachers, which are often the result of personal attitudes and values, personality, previous experience and availability of resources. Hargreaves (1972) distinguishes between three major teaching styles, which he labels 'lion tamers' (firm discipline, teacher as expert); 'entertainers' (multiple resources, active group work); and 'new normalities' (negotiated, individualised teaching).

Ryan and Cooper (2008) have identified four dominant teaching styles:

- **Concrete sequential** teachers rely on hands-on materials, working models and displays to help students learn, and tend to use task-oriented lessons.
- **Abstract sequential** teachers value depth of knowledge and help students think about topics and to generate ideas.
- **Abstract random** teachers capitalise on student interest and enthusiasm rather than adhering strictly to a lesson plan.

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- **Concrete random** teachers rely on a variety of resources and organise their classes so that students operate independently or cooperatively.

These are just a few of the many groupings that have been produced to describe teaching styles. The major point to stress is that there are many differences and teachers need to be aware that teaching styles will be dependent on such factors as:

- type of activity in the classroom
- type of organisation of the classroom
- use of resources
- grouping and organisation of students
- students' roles in the classroom
- criteria used for assessing students
- nature and amount of student and teacher talk.

Yet it is also important to heed Joyce and Weil's (1986, pp. 433–434) caveats about learning styles, namely:

- It is not possible for teachers to assess the developmental levels of all their students and then create totally personalised curricula exactly matching their levels.
- Students can and will adapt to different teaching styles if we give them the chance.
- The simplest way to discover the environments in which students progress best is to provide them with variety and observe their behaviour.

These authors are emphasising the adaptability that is required of teachers and students. No teacher has a fixed style of teaching and no student has a fixed style of learning. In teaching–learning situations it is crucial that participants be flexible and adaptable.

Joyce and Weil (1986) provide additional insights to learning and teaching styles by their use of the term 'discomfort'. They argue that a discomfort factor is necessary for teachers and students. If an environment is perfectly matched to the developmental levels of learners, it can be too comfortable and there will be little advance beyond that level. That is, discomfort is a precursor to growth (see also Chapter 4). Teachers need to be constantly trying out new teaching styles even if they are unfamiliar and cause discomfort. For their part, teachers must assist students to acquire the necessary skills to adapt to new, unfamiliar learning styles. On the other hand, a quotation that has gained much ground in recent years exhorts teachers to consider the ways their students learn and adapt their teaching accordingly: 'if a child can't learn the way we teach, maybe we should teach the way they learn' (Ignacio Estrada).

As you spend more time in schools and develop your own philosophy of teaching, you will need to consider your own stance on teaching and learning as your position will influence the ways you teach and the ways you support student learning.

IMPACT OF STANDARDS ON TEACHING AND LEARNING

The impact of standards and standards testing has been most notable in the United States and the United Kingdom and is increasingly being felt in Australia. In the US the *No Child Left Behind Act* of 2001 (NCLB) aims to improve the standards of teacher accountability by the use of standardised assessments (Fuhrman & Elmore, 2004). If a school does not meet the proficiency standards for all

sub-groups of the student population (including African Americans, Latinos, low-income students and special education students), corrective action is taken such as acquiring additional tutoring for students or transferring poorly performing staff.

As might be anticipated, the NCLB has put teachers under considerable pressure to 'teach to the test' and to use more direct instruction and practice drills as their main approaches to teaching and learning (Marsh & Willis, 2007).

In the UK, national initiatives such as the National Literacy and Numeracy Strategies have been implemented to improve learning and to raise standards. Teachers are encouraged to use up to 15 minutes of whole-class teaching in literacy and numeracy each day for primary school students. Myhill's (2006) study concludes that the whole-class discourses are typically teacher-directed, to lead students to a predetermined destination. Burns and Myhill (2004) conclude that teaching in the UK now sits within 'a heavily accountable teaching culture, [and a] highly instructional, objectives-based pedagogy' (p. 47).

In Australia, standards, essential learnings and quality teaching have been major priorities. Quality teaching in particular has been comprehensively developed for use in NSW public schools and ACT public schools (NSW Department of Education & Training, 2006; ACT Education & Training, 2006; Ladwig, 2009; DEEWR, 2012).

The implementation of Phase 1 Australian Curriculum subjects will inevitably lead to closer monitoring of standards. It is already evident that national testing (NAPLAN) is leading to restrictive approaches to teaching and learning: a study conducted by the University of Melbourne in 2012 found that over 70% of educators surveyed taught to the test and 69% said NAPLAN meant that they spent less time teaching subjects that were not tested (Topsfield, 2012). Teaching to the test may not be possible to the same degree if steps by ACARA (the organisation responsible for the testing) come to fruition. According to the *Courier Mail* (29 June 2013) ACARA announced that they will not inform teachers of the focus of the writing task in the national literacy test – in past years teachers have known the type of writing on which students will be tested, but in the future this may not be the case.

MAKING USE OF TECHNOLOGY

All teaching and learning modes of instruction make use of some form of technology, ranging from chalk to elaborate computer packages. Some forms of technology we take for granted – such as paper, marker pens and whiteboards – especially if they do not interfere with a well-proven, traditional mode of instruction. Even data projectors have minimal interference on teacher-directed forms of delivery.

It is when major behavioural changes are called for that teachers espouse concerns about using technology. There may be good reason for this technophobia if it involves different grouping patterns of students, if the authority of the teacher role is reduced, or if the teacher has to learn new skills. Fear of using computers in schools – dubbed 'cyberphobia' by Russell and Bradley (1996) – may be quite deep-seated and may occur in young teachers as well as older, highly experienced teachers.

There are many proponents of incorporating computers (including laptops, notebooks, iPads and the like) into classroom activities; that is, technology-infused instruction. As long ago as 1997, Gardner claimed that computers 'will become as integral a part of the classroom as the whiteboard' (p. 6), while even earlier, Betts (1994) claimed that 'multimedia creates rich learning environments where kids really thrive' (p. 20). It is interesting to see the level of computer and electronic device

use in contemporary classrooms to determine if these early assertions became reality. If teachers have 'cyberphobia' or 'technophobia' then multimedia-rich environments will not be the norm, and computers will not be as integral as the whiteboard. This, in part, depends on you. How you incorporate technology into the classroom, the level of comfort you feel using technology, how active you are in trialling and developing pedagogical approaches that require knowledge of multimedia will depend on your familiarity with technology and with technology-infused teaching. This is important if your students are to achieve the ICT General Capability, part of the Australian Curriculum. This might be an opportune time to read through the ICT General Capability as it will provide vital information on the expectations of students, and thus on you as a teacher.

Instructional opportunities for students (Computer Assisted Instruction – CAI) are forever increasing (Tamim et al., 2011). Consider the following examples:

- Skills software for drilling and practising – skills software programs offer interactive experiences, generally with immediate feedback about performance (Burke, 2002).
- Computer graphics programs enable students to experience the world other than through verbal and print language. According to Norton and Wiburg (2003, p. 53), 'shape, size, proportion, relationship, scale, surface, texture and rhythm are all expressed more rapidly through image making than through using words'.
- Desktop publishing programs and web-based editing tools – Desktop publishing allows students to create high-quality documents that include text and graphics. Web-based editing tools enable students to easily create web pages for publication on the internet (Richardson, 2011).
- Databases – text-based databases include text-only information; hypermedia databases provide information with access through links; multimedia databases include a variety of media forms including pictures, video clips, text and sound.
- Blogs (weblogs) - Blogs provide commentary or news on particular subjects. Many teachers encourage students to develop blogs as personal online diaries (Richardson & Watt, 2006; Ohler, 2006; Richardson, 2011).
- Internet – Access to information is available through the use of search engines. Students develop information searching skills and also evaluative skills.
- Simulations – many educational software publishers produce simulations. 'Students are given the power to "play" with a model of the subject being studied and to experience the effects of changing different variables in the model' (Norton & Wiburg, 2003, p. 57).
- Mathematical devices provide students with the opportunity to explore real-time data. For example, Probeware allows students to measure temperature, humidity, distance and many related variables. Large amounts of data can be collected in a class period and can allow students to see multiple representations of their surroundings in real time.
- Spreadsheets allow students to create charts and graphs that visually represent collected data.
- Software that assesses student performance is increasing rapidly. There are now programs available that create a variety of rubrics. (Criteria for judging performance are provided; electronic portfolios of work can be created; problem-solving processes of students can be observed and recorded; and a new set of interpretive tools is being created to monitor higher-level thinking and group collaboration.)
- Smart boards, used in many classrooms, have a student response system that allows students to silently answer teachers' questions using hand-held keypads. It encourages shy children to voice opinions and become more engaged.

In summary, computer technology has the potential to greatly benefit classroom instruction because it:

- provides the flexibility to meet the individual needs and abilities of each student (Norton & Wiburg, 2003; Scherer, 2011)
- provides students with immediate access to rich source materials beyond the school and beyond the nation – that is, it can be used to foster cross-cultural perspectives (Khan, 1997; Coiro & Fogleman, 2011)
- presents information in new and relevant ways (Thornburg, 2002)
- encourages students to try out new ideas and to problem solve (Grabe & Grabe, 2000; Means, 2000; Christophersen, 2006)
- encourages students to design, plan and undertake project-based multimedia learning (Simkins et al., 2002)
- motivates and stimulates learning (Norton & Wiburg, 2003)
- enables students to feel comfortable with the tools of the Information Age
- enables teachers to move from information-giver or instructor, to facilitator of learning (Carey, 2006).

The limitations in using computer technology are rapidly decreasing as a result of greater teacher familiarity, cheaper costs of equipment and more user-friendly software. Nevertheless, there are still issues which can lead to limited take-up in some schools, including the following:

- Insufficient school budget for sufficient numbers of personal computers, software, network wiring and support technicians to be available (Cradler & Bridgforth, 2004).
- Recent research evidence is equivocal about whether teachers can produce higher levels of student achievement using computer technology. Tamim et al.'s (2011) meta-analysis asserts there is a slight but significant higher average effect size. Conversely, Goodwin (2011) concludes that most large-scale evaluations of use of computer technology have concluded that there are mixed or no results.
- Computer technology is not a neutral force in the classroom. It concentrates on speed and power and downplays student reflection and ethics (Schwartz, 1996).
- There are reports of considerable health risks for teachers (eye strain, wrist and shoulder pain) and for students (one study in the US found that the prevalence of myopia (near-sightedness) was '66.4% higher among participants aged 12 to 54 years in a 1999–2004 study than in the 1971–1972 study' (Vitale, Sperduto & Ferris, 2009, p. 1636)). There are other associated health risks and it would be wise to learn about some of these and take them into consideration when making pedagogical decisions.
- A growing number of cases of student cheating (cyber-cheating) and cyber bullying are occurring at all levels of teaching (Varnham, 2001; Poole, 2004; Franek, 2006; Hinduja & Patchin, 2011).

You will have your own view on whether computers should feature in classroom life, and to what extent, but it is important to base your view on the research evidence. This is more difficult when there are contradictory findings, and so perhaps, as with most things in life, you should determine where the balance is. This will happen with experience in classrooms and with trialling a mix of computer-free days and computer-reliant days. What works for one group of students may not work for another. One final point: it is important to think about this issue in relation to the earlier discussion on learning. How might computers, or any technology, help your students achieve improved learning outcomes?

TEACHING AND LEARNING PHASES OF INSTRUCTION

Before embarking on a detailed analysis of specific approaches to teaching and learning, it is important to note that within each approach there are relatively common phases that tend to occur. These phases consist of:

- *Preparation*: the teacher readies the students for what they are about to learn.
- *Presentation*: the teacher transmits the new knowledge.
- *Comparison and abstraction*: students and the teacher examine the new particulars and make comparisons.
- *Application*: the general principles developed are put to use.

There are many variations that have been developed since these phases were first articulated but all have some introductory phase, a main activity phase, and a concluding or application phase. The amount of emphasis given to each phase will depend upon the orientation and value stance of the pedagogical approach. Some illustrative examples are included in Figure 11.2.

The historical example provided by Broudy and Palmer (1965) in Table 11.2 is very teacher-dominated, in terms of the lock-step set of procedures, whereas Joyce and Showers' (1986) set of phases is far more cyclical in nature. The pre-active activities involve planning but also guessing

1 Preparation for instruction 2 Motivation 3 Presentation of the learning task	1	Preactive phase
4 Inducement of the trial response 5 Correction of the trial response	2	Interactive phase
6 Fixation of response 7 Text response and evaluation	3	Post-active phase

FIGURE 11.2 ● Examples of phases of instruction

Sources: Broudy & Palmer (1965); Jackson (1968); and Joyce & Showers (1986).

TABLE 11.2 ● Comparing teacher-directed and student-centred approaches

	Teacher-centred Transmission Model	Student-centred Constructivist Model
Theoretical emphasis	Cognitive, Behavioural, Information Processing theories	Cognitive and Social Constructivist theories
Teachers' roles	Teacher designs lessons to achieve predetermined standards	Teachers involve students in planning – some autonomy
Students' roles	Mainly passive listening and practising pre-specified skills	Mainly active, interaction with others
Planning tasks	Mainly teacher dominated	Teacher and student input
Learning environments	Mainly tightly structured	Loosely structured
Assessment structures	Traditional paper and pencil tests	More performance assessments

Sources: After Arends (2012); Cruickshank et al. (2012); Moore (2012); and Eggen & Kauchak (2012).

about interactive phase activities that may occur. The interactive-phase activities can be partly planned but they also involve on-the-spot decision-making and reacting to students' responses. Teachers need to be able to 'read' students' responses using skills that Joyce and Showers (1986, p. 14) refer to as the 'invisible skills of teaching' – that is, the ability of the teacher to read 'in-flight' information from the students and to construct responses to student behaviour (and, most importantly, the ability to withhold or delay responses).

This issue will be discussed later with reference to individual approaches, but suffice to say it emphasises the point that various influencing patterns are in operation in every classroom, in activities where the teacher influences students, and in activities where the students influence the teacher. As a result, activities or strategies initially planned by a teacher may need to be aborted, revised or continued as a result of student reactions. Students, in turn, either overtly or covertly accept a teaching and learning approach, or attempt to modify it or, on rare occasions, reject it outright.

APPROACHES TO TEACHING AND LEARNING

Teachers are often urged to use a variety of approaches and strategies to ensure that diverse student interests and abilities can be accommodated. Yet teachers can be limited in the strategies they can use because of:

- restricted student abilities and interests
- the high number of students in a class
- the limitations of the teaching room
- insufficient background or knowledge about a specific instructional mode
- the technology available.

The last point is especially important in that technology has varied application for all approaches. Simplistically, it might be argued that the computer is used as a tutor for teacher-directed lessons (knowledge instruction) and as a tool in student-centred lessons (knowledge construction) (Gibson, 2002).

In broad terms it is possible to consider a simple dichotomy of teacher-directed and student-centred approaches (see Table 11.2). However, there is a danger of over-stereotyping. Not all teacher-centred lessons are carefully pre-planned and students in these classes are not always passive listeners. Similarly, constructivist lessons are not always student-initiated and loosely structured. Nevertheless the distinction between the two approaches needs to be remembered.

It is possible to be more specific and use similar categories to classify each mode of instruction as listed in Table 11.3.

A wide variety of approaches is available and most teachers have the opportunity to expand their repertoire. Some major approaches are described below.

Lectures, teacher talks, expository talks and teacher presentations

A lecture is an oral presentation usually given by the teacher. Cruickshank, Jenkins and Metcalf (2012) prefer to describe it as a teaching method where the lecturer talks, acts, persuades and cajoles. It can be a formal lecture, which tends to be long, uninterrupted and highly structured; or an informal lecture, which tends to be brief and includes some student participation. Both types tend

TABLE 11.3 ● Teacher-directed/student-centred emphasis in lessons

Modes of instruction	Intro	Major activity	Conclusion	Teacher role	Student role	Organisation mode
Lecturing or teacher talks	T	T	T	present information	listen and respond	total class
Practice drills	T	T/S	T	repeat examples until skills mastered	respond and practise	total class or small groups
Directed questioning	T	T/S	T	present question	respond with answer, occasional questions	total class or small groups or individual
Discussion	T	T/S	T/S	question, listen, respond	listen, respond, question	total class or small groups or individual
Demonstration	T	S	T/S	present information materials	observe, listen, practise	total class or small groups
Direct instruction	T	T/S	T	direct activities, monitor	respond and practise	total class
Constructivism	T	S	T/S	introduce, question	participate, respond, question	small groups
Cooperative learning	T	S	T/S	introduce, monitor	interact, engage in activities	small groups
Problem solving or inquiry	T	S	T/S	direct activities	engage in activities	small groups or individual
Role-playing, simulation games	T	S	T/S	introduce, monitor	participate or act out	small groups
Small group activity	T	S	T/S	introduce, supervise	participate, interact, report	small groups
Independent study	S	S	S	facilitate, monitor	initiate, engage in activities	individual

T = Teacher directed
S = Student centred

to include various multimedia supports such as a Prezi, PowerPoint, posters or artefacts. At primary and secondary school levels, most would agree that informal lectures of up to 20 minutes are the preferred version of the two forms.

Lectures can be effective. Some of the advantages are listed below.

- They enable information to be transmitted quickly and directly.
- They are a useful way of introducing a new topic.
- They are successful if the main purpose is to disseminate information (rather than to develop skills or values).
- They can be valuable if the material is not available elsewhere.
- They can be adapted at short notice.
- They can enthuse and motivate students.

Contrary to popular opinion, which tends to denigrate lectures as passive, boring and ineffective, research studies have demonstrated that lectures are at least as effective as other instructional approaches (Eggen & Kauchak, 2012; Rosenshine & Stevens, 1986). Although lectures have survived as an instructional approach over centuries, there are specific aspects that must be considered for them to be effective for primary and secondary school students.

The good lecture is one which challenges the imagination of each student (Cruickshank, Jenkins & Metcalf, 2012). Students should feel free to ask questions and the teacher should build on these questions and responses.

Important characteristics of good lectures include:

- keeping your voice at an interesting pitch, using expression and making sure all students can hear you
- encouraging students to ask questions
- using a number of multimedia aids, models, hand-out sheets and whiteboard drawings (to focus the attention of the student, serve as a reference point and to make the subject understood) at the beginning, stating the key points to be made
- presenting the lecture in a lively, vibrant manner so as to engage students
- ensuring that the lecturer demonstrates teachers' own intense interest in the topic
- limiting the lecture to 20 minutes and keeping the content appropriate to the interests and abilities of the students
- following key statements and questions with strategic pauses
- interposing students' names into the lecture and relating content to areas that interest the students
- using notes sparingly to ensure optimal dramatic effect.

There are, of course, many potential problems in using lectures. Some of the disadvantages of lectures include:

- not allowing for student creativity or problem solving
- at the worst, becoming an 'ego-trip' for the teacher
- leading to student boredom
- providing minimal opportunity for social development.

Lectures continue to be widely used by teachers. In many cases, classroom discourse continues to be teacher-dominated and the lecture mode maintains this power relationship. A noted earlier, using presentation software such as PowerPoint or Prezi can make lectures more appealing and effective. Isseks (2011) contends that the traditional bullet point style of PowerPoint presentations only highlights important information to be absorbed by students, leaving little opportunity for student discussion. However, the inclusion of photos, images, audio and video clips can add considerable impact to the lecture and can stimulate discussion (Cruickshank, Jenkins & Metcalf, 2012).

A study by Savoy, Proctor and Salvendy (2009) on the use of PowerPoint presentations compared with traditional lectures concluded the following:

- for retaining complex graphics and figures, PowerPoint presentations had an advantage
- for retaining information and concepts that are best conveyed through dialogue, traditional presentations are best.

The following list reports on research conducted on the efficacy of lectures – what has and hasn't been found to work.

- Poo and Thye (2006) compared e-lectures with normal lectures with Junior College students. There was no significant difference although high-ability students had a slight preference for learning through e-lectures.
- Das and Rahimah (2006) studied the effectiveness of using animated PowerPoint lectures with secondary students. They concluded that Year 8 students were very positive about using these lectures and worked on them at their own pace.
- Babb and Ross (2009) investigated the value of giving students online lecture slides before the lecture. They concluded that students were happier having the online lecture slides in advance – it enabled them to have a better understanding of materials.
- Schmid (2008) researched the use of multimedia lectures using Smart Boards and concluded that multiple representations were only useful if students actively processed the information.
- Schriever (2011) reported on a project with a Year 3 class. The teacher used an interactive whiteboard to reinforce her 'chalk and talk' presentation.

Practice drills

The term *practice drills* probably conjures up all kinds of negative memories about learning times tables, but the fact of the matter is that practice through repetition is very necessary in certain areas, such as mathematics, spelling, grammar, and skills development.

The purpose of practice drills is to achieve mastery and perfection to the extent that students can recall information quickly and reliably. Computer programs and language laboratories greatly extend the opportunities for students to undertake (and enjoy) drill sessions. Computer programs are available mostly in mathematics, spelling, foreign languages and other subjects where the content is well structured. For many of these subjects, a direct instruction model is used (see later in this chapter): namely, a problem situation is presented, students are asked to find a solution, and they are given feedback on their level of success. Correct solutions enable students to move on to more difficult situations. Incorrect answers prompt remedial problems for students to solve (Arends, 2012).

Yeh and Lo (2009) used an online corrective feedback and error analysis system with students in an English as a second language class. With this system teachers can mark error corrections on online documents and students can receive corrective feedback instantly.

Tan and Pakiam (2007) used video presentations to communicate ideas to young writers in Primary 2 classes and found it to be very successful, while Boon and Yong (2006) used 'The Maths Story' software to help weak students to learn how to use trigonometric ratios in lower secondary classes.

Other computer programs enable students to develop information literacy. For example, skills in retrieving data from online databases need to be practised. Students at primary and secondary school enjoy learning the procedures because the multimedia presentations occur in the form of audio, video clips and still pictures.

Practice drills can be effective with students if the following points are observed:

- Keep practice drills short – 10–15 minutes.
- Vary the amount and kind of drill according to the needs of the students.
- Encourage students to record their progress in practice drills.
- Use practice drills incidentally and interspersed with other activities.
- Use games for practising drills.
- Ensure that students understand why it is necessary to gain mastery of specific concepts or skills.

Too often practice drills can be:

- very boring
- too long and too frequent
- of negative interest to many students.

Directed questioning

The use of questions to students, both oral and written, is a very common approach to teaching. There are various reasons why teachers use questions though not all are related to student learning. Questions are used to:

- get immediate feedback during a demonstration
- focus a discussion
- pose a problem to be solved
- help students sharpen their perceptions
- attract a student's attention
- encourage a particular student to participate
- diagnose a student's weaknesses
- allow a student to shine before his/her peers
- build up a student's security to an extent where the teacher is quite sure the student will respond appropriately.

Questions can be used in rapid-fire succession or they can proceed more slowly with time for thoughtful responses. The types of questions you ask will determine the kind of thinking you want your students to do. Various writers have provided different classifications of questions. Some of these include:

- *high and low order questions*:
  - low order – mainly recall of facts and specifics
  - high order – mainly analysis and evaluation
- *convergent and divergent or closed and open questions*:
  - convergent/closed – leads to expected answers
  - divergent/open – allows new directions in answers
- *what, when, how, who and why*:
  - a useful range to use, which proceeds in sequence from low order to high order.

Asking appropriate questions is a difficult task and requires considerable practice. A useful starting point is to choose a topic and then write down a range of questions that cover the sequences listed above. Ensure that the questions are concise and at an appropriate level of difficulty for students. Eliminate questions that appear to be ambiguous or vague. Table 11.4 provides some useful beginnings for questions, and these can be used based on the purposes you have in mind.

It is timely to remember that preparing good questions is only part of the exercise. Knowing how to present the questions to the class and responding to their responses is of major importance. A basic rule is to ask the question, pause and then call on a specific student by name to respond (Orlich et al., 2009). Using eye contact; distributing questions around the room; giving your students plenty of time to answer (wait-time of three to five seconds); extending thinking by using further probes such as

TABLE 11.4 Some examples of question beginnings

To assess knowledge	Define, Describe, Tell, List, Who, When, Identify, Where
To check understanding	How do you know? Explain, Compare, Contrast
To help analyse problems	What causes, How, Why?
To explore values	How do you feel? Why do you prefer? Why do you feel?
To encourage creative thinking	What if, How else, Just suppose
To evaluate	Select, Judge, Evaluate
To apply knowledge	Demonstrate, Use the information to, Construct

Source: Adapted from Roe et al. (1989), p. 169.

'Are you sure?' or 'Give me an example' are just some of the techniques to ensure successful use of directed questioning.

Môore (2012) has a more detailed list of guidelines to help teachers refine their questioning skills, namely:

- Ask clear questions.
- Ask your question before designating a respondent.
- Ask questions that match your lesson objectives.
- Distribute questions about the class fairly.
- Ask questions suited to all ability levels in the class.
- Ask only one question at a time.
- Avoid asking questions too soon.
- Pause for at least three seconds following each question.
- Use questions to help students modify their responses.
- Avoid too many questions that give away answers, and avoid one-word-answer questions.
- Reinforce student answers sparingly.
- Listen carefully to student responses.

Often students are anxious about teacher questions and, in particular, their answers, because they realise that they will be judged by their peers as well as the teacher. They may be cautious in answering because of a lack of self-confidence. If the climate of the classroom is positive and supportive, students may be more prepared to take personal risks. It is up to the teacher to support students who are not confident about answering questions by using rephrasing of questions, asking supplementary questions or providing additional information.

Over to you

Have you analysed your questioning technique in the classroom?

- **Do you ask a range of questions?**
- **Is the level of your questions appropriate for the class?**
- **Do you ask questions that challenge students to think in creative ways?**
- **Do the students appear to be comfortable with the questions you ask or are they sometimes confused?**

Direct instruction

Direct instruction is a teacher-centred mode of instruction. The focus is on promoting student learning of knowledge by having lessons that are well-structured and can be taught in a step-by-step process (Arends, 2012). Killen (2009) refers to direct instruction as the use of 'well-scripted lessons' (p. 80).

The purpose of direct instruction is to help students learn basic academic content (such as reading or mathematics) in the most efficient way. According to Arends (2012) there are five steps involved, namely:

- establishing set
- explanation and/or demonstration
- guided practice
- feedback
- extended practice.

Cruickshank, Jenkins and Metcalf (2012) contend that direct instruction is characterised by three words – practice, practice, practice! Researchers working in the area of direct instruction have compiled some of the key elements, as listed in Figure 11.3.

The planning of direct instruction lessons requires specific behaviours and decisions (Eggen & Kauchak, 2012). It could be argued, therefore, that direct instruction is based on behavioural principles.

The *planning* involves the following:

- The teacher prepares objectives that are student-based and specific, specifies the testing situation and identifies the level of performance.
- Task analysis is used to define precisely what a learner needs to do to perform a specific skill and involves dividing the overall skills into sub-skills and putting these into logical order.
- The teacher's time management is most important; he/she needs to ensure that there is sufficient time to match the abilities of the students.

The actual *teaching* of direct instruction lessons involves:

- The teacher explaining the objectives of the lesson and how it follows from previous lessons.
- The teacher demonstrating the particular skill to be learnt.
- The teacher assigning short, meaningful amounts of practice. This may involve over-learning to establish complete mastery.
- The teacher checking understanding and providing feedback.

- Teacher centrality – teacher exerts strong instructional direction and control.
- Task orientation – major emphasis is on academic learning (not social learning or higher level thinking).
- Positive expectations – the teacher is concerned about the academic progress of each student and he/she expects each student to be successful.
- Student cooperation and accountability – students are held accountable for their academic work.
- Non-negative affect – the teacher ensures that the learners feel psychologically safe and secure and are not threatened.
- Established structure – the teacher establishes class rules and ensures that they are implemented.

FIGURE 11.3 ● Key elements of direct instruction

Source: After Murphy, Weil & McGreal (1986).

A number of studies (Peterson, 1979; Rosenshine & Stevens, 1986; Cruickshank, Jenkins & Metcalf, 2012; Vitale & Joseph, 2008) have demonstrated that direct instruction is:

- very effective when the content to be learned is well-structured, clear and unambiguous
- superior when the goal is to improve achievement in basic skills as measured on tests
- very effective for teaching younger, less able students.

There are of course limitations with direct instruction: Slavin (1999) concludes that it de-emphasises students' autonomy; Peterson (1979) contends that the approach does not promote creativity and problem solving; while Arends (2012) notes that, although direct instruction is widely used in American classrooms, it places far too much emphasis on teacher talk.

Demonstrations

Demonstrations by the teacher can be used with students of all ages and across all subjects. They can range from an elaborate scientific demonstration to the total class to demonstrations of a skill to a single student. Demonstrations can be especially appealing to students, and not simply because they represent a change from the usual classroom routines. However, it is important that the teacher is not only knowledgeable about the topic but also uses a variety of aids to ensure that students understand what is being demonstrated.

Some reminders to ensure successful demonstrations include the following:

- Make sure that it is kept simple, at an appropriate difficulty level and focused – do not try to teach too many concepts.
- Ensure that all students can see and hear the demonstration.
- Check frequently during the demonstration to ensure that students are following.
- Make sure that a wide range of objects and models are used to aid the demonstration.
- Where appropriate, students should be encouraged to demonstrate the activity or process.
- Use a lively, enthusiastic style.
- Ensure that all safety considerations have been met.

Online teaching

Online teaching can range from the use of multimedia resources accessible from digital repositories to complete instructional courses (Freebody, 2005). The online environment is unique because of its capacity to shift the time and place of delivery compared with traditional teaching (Cruickshank, Jenkins & Metcalf, 2012).

Online communities are developing rapidly as is the idea of the 'flipped' classroom. The idea of a flipped classroom is catching hold in many educational settings and, as the name suggests, turns the time spent in classrooms and at home around. While there is not just one model of a flipped classroom, according to Tucker (2012):

> *the core idea is to flip the common instructional approach: with teacher-created videos and interactive lessons, instruction that used to occur in class is now accessed at home, in advance of class. Class becomes the place to work through problems, advance concepts, and engage in collaborative learning. Most importantly, all aspects of instruction can be rethought to best maximize the scarcest learning resource—time. (p. 82)*

Synchronous tools (such as chat rooms and instant messaging) and asynchronous communication tools (such as email, discussion boards and blogs) can facilitate the implementation of online courses, plus can also be used in a flipped classroom model. MOOCs (Massive Open Online Courses) are gaining in popularity and availability and while they were originally designed for university students they are increasingly being developed for students of all ages. MOOCs are also being developed for teacher professional development for K–12 teachers <www.coursera.org>. While these, initially at least, are developed in the US, many Australian universities and organisations are watching the growth of MOOCs with interest.

Digital resources, such as those found on Scootle <www.scootle.edu.au>, provide media-rich resources for teachers to use in their teaching. Students can also access these resources, which can help engage students, provide teachers with additional ideas for their teaching, and provide resources not easily accessible through other means.

Online teaching is also a boon to students who live in rural and remote areas. Since the early 2000s students in rural areas of New South Wales and Queensland have been offered online (asynchronous) and real-time (synchronous) forms of instruction (Ford, 2001; Hansford, 2000). The Tasmanian eSchool is one of the newest in that state (commencing in 2010) and offers educational programs and online courses to students (K–10) who meet specific criteria, including isolation, medical conditions and pregnancy. Students who are travelling can also enrol in the eSchool for specific periods of time. The eSchool uses a blended learning approach and has freely accessible online resources.

Research has been conducted into e-learning opportunities, and a selection of research findings follows:

- Vighnarajah, Wong and Bakar (2008) surveyed secondary school students' use of self-regulated online community discussions. There was general positive perception in using the forum, chat and dialogue tools.
- King and Robinson (2008) used an electronic voting system to enliven the classroom and to enable large numbers of students to respond to questions in real time during class.
- Ramos and Yudko (2006) concluded from their study that the number of hits rather than discussion posts were the better predictors of student success in online courses. They considered that students who engaged in online discussion had a tendency to engage in shallow discussion.
- Yon, Ling and Aik (2006) used online questions to motivate lower secondary students learning science. They concluded that students became more motivated in terms of spontaneity in asking questions and taking initiatives.

Using research evidence such as this when implementing new approaches to teaching and learning can help teachers overcome problems or challenges that they otherwise might not have thought about, plus add to their justification for introducing new pedagogical approaches into their classroom practice.

Problem-based learning

Problem-based learning focuses on maximising student understanding. According to Woolfolk (2012), it is a mode of instruction that emphasises the active role of the learner in building understanding and making sense of information. There is also a very strong emphasis on collaborative learning among students and the teacher whereby all are actively engaged in formulating questions, addressing complex issues and resolving problems (Holt-Reynolds, 2000).

Constructivism, a theory of learning that underpins the problem-based learning approach, can be traced back to the philosophical principles enunciated by Dewey, to psychologists such as Piaget and Vygotsky, and educational movements such as progressive education and inquiry/discovery learning (Cruickshank et al., 2012).

It is often stated that constructivism is one of the most challenging yet rewarding approaches to teaching. Figure 11.4 outlines the major characteristics of constructivism. These characteristics indicate the active learning processes and the need for collaborative dialogue and searching for creative solutions within a community of learners. According to Arends (2012), the school's curriculum becomes 'a set of learning events and activities through which students and teachers jointly negotiate meaning'.

As in all areas of teaching, research has been conducted on this form of teaching and the principles which underpin it. Here is just a sample of that research.

- De Leng et al. (2008) successfully used a constructivist e-learning model to foster critical thinking on basic science concepts.
- Alonso, Manrique and Vines (2009) compared the use of constructivist e-learning in distance mode with face-to-face traditional teaching. They concluded that achievement grades were similar for both methods.
- Yong, Gene and Abaullah (2006) used a social constructivist model of teaching with 4th grade primary students. They concluded that the ICT interface they used was a good platform for the integration of social constructivism across subjects.
- Wee and Woo (2006) used a constructivist software package 'Fun with Construction', to encourage students to explore topics in geometry and to use the virtual geometric instrument to understand and solve simultaneous equations.

While there are many proponents of constructivism, calls for pedagogical reform have generally not been widely accepted. Constructivism can create a variety of problems, including classroom management, provision of support, materials, time required for covering the curriculum and teachers' limited understanding of students' developmental knowledge (Brandt & Perkins, 2000; Kirschner, Sweller & Clark, 2006).

Discussion

Discussion in large or small groups is an effective teaching strategy, especially for controversial or low consensus topics (Killen, 2009). Discussions can be largely teacher-dominated – as in the case of whole-class discussions – or students can be delegated the task of small group leaders.

- Learners construct their own meaning.
- Active learning rather than passive learning is emphasised.
- Learners engage with concrete (authentic) tasks rather than the abstract – they use raw data and primary sources along with manipulative interactive tasks and physical materials.
- Learners are encouraged to engage in dialogue with the teacher and other students – learning is more effective in 'communities of learners'.
- Learners are encouraged to relate new information to what they already understand through bridging.
- Teachers must provide learners with assistance or scaffolding to help them progress.
- Teachers provide time for students to construct relationships.

FIGURE 11.4 ● Characteristics of constructivism

Source: After Cruickshank, Jenkins & Metcalf (2012).

A discussion can serve a variety of purposes including:

- To ensure mastery of a subject – to further discuss a topic that has been taught to ensure that the details are firmly grasped by students (Parker & Hess, 2001).
- To have students examine questions that have no simple answers and require opinions, ideas and debates. An example of such a question could be 'What can be done about the growing world population?' (Moore, 2012).
- To have students solve a problem. Students can be given political, economic or social problems to discuss and resolve (Cruickshank, Jenkins & Metcalf, 2012).
- To have students discuss issues that are strongly affective in nature. For example, discussions could focus on student attitudes towards drug use or civic duty.
- To help students improve their face-to-face or interpersonal communication skills. Small group discussions can help students develop skills in leadership, being active listeners, and handling disagreements and conflicts.

It should be noted that this approach is of less value with young children, who generally do not have the levels of reasoning required (Creative Curriculum Net, 2006).

To be effective, it is important that the arrangement of furniture is conducive to group discussions. Circles of chairs, horseshoes and other configurations are usually the most effective to ensure face-to-face communication.

When using this approach to teaching, it is essential that the teacher is willing to relinquish some authority and to tolerate various directions (and dead-ends) that a discussion might take. Accepting low degrees of structure and organisation can be difficult for some teachers and may require considerable adjustment.

It is essential that student leaders are aware of different points of view about a topic prior to commencing small group discussions and that they ensure all members of the group have opportunities to express their opinions. It may be necessary to formulate some minimal rules of procedure – for example, the right to request a student to clarify a point or to ask additional questions for clarification.

In small group situations the teacher's role is largely to monitor the activities and to be a resource person. Most of the time it may be appropriate just to remain silent; however, on occasions it may be necessary to interject a comment. It is useful for the teacher to take notes on processes and achievements of each small group and this can provide valuable data for feedback to the students at the completion of the activity.

Discussions can also take place online in chat rooms and discussion forums where students may express their views on a variety of topics. These may be teacher-initiated discussions or simply peer-initiated, informal discussions in out-of-school time.

Online discussions may increase student participation as some students may be motivated to continue talking about important topics after the lesson has ended. One difficulty with online discussions at this point in time is that students can't see the participants and therefore can't appreciate the nuances of body language. This technological barrier is already being overcome for discussion between pairs. For example, Yamada (2008) studied four kinds of synchronous computer-mediated communication namely videoconferencing (image-voice); audio-conferencing (voice but no image); text chat with image (image but no voice) and plain text chat (no image and no voice). He concluded that image and voice options best promoted consciousness of natural communication.

Cooperative learning

Cooperative learning is discussed in detail in Chapter 8 (p. 141). As concrete examples help develop understanding, in this case of successful implementation of approaches to cooperative learning, we have included the following to illustrate the diversity of this approach as well as to demonstrate the types of research teachers undertake in their classrooms as a means of developing their practice.

- Suan (2006) uses an ability-grouped buddy system to teach English to a secondary (Year 10) class. Interviews undertaken after the research period revealed that students appreciated the system of support from the Buddy Team groupings.
- Lau (2006) used a cooperative learning approach to teach a Geography unit to a secondary (Year 10) class. The results indicated that students were more engaged in the cooperative learning strategies than in traditional groupings.
- Yeo et al. (2006) used a cooperative learning model to teach algebra to a secondary (Year 8) class. The researchers used a peer tutoring structure where within each cooperative learning group there was a peer tutor and two students. Although peer tutoring did not improve students' test marks, students were very positive about the approach.

Problem solving, inquiry and discovery

Problem solving, inquiry and discovery modes of instruction enable students to learn by doing. Students can use inquiry activities in a variety of subjects and at all ages, although more abstract versions are more suited to secondary school students (Hoek & Seegers, 2005; Maloney, 2010; Eggen & Kauchak, 2012). Some advantages of this instructional mode include that it:

- is economical in its use of knowledge – only knowledge relevant to an issue is examined
- enables students to view content in a more realistic and positive way as they analyse and apply data to the resolution of problems
- is intrinsically very motivating for students
- enables the teacher to become a facilitator of learning
- provides superior transfer value compared with other forms of instruction.

The internet provides excellent opportunities for students to undertake inquiry projects (Killen, 2009). Some examples of teachers' practice are below and illustrate the diversity of topics, teaching approaches, and technologies used.

- Li and Lim (2007) examined the use of scaffolding for online History problem solving for lower secondary students. They concluded that where students interacted with the scaffolding, they achieved a higher performance.
- Yang, Newby and Bill (2007) investigated the effectiveness of structured web-based discussions in problem-solving units in science. Their findings were that critical thinking skills were greatly advanced through the use of online discussions.
- Kao, Lin and Sun (2008) developed a computer-based integrated concept mapping system to assist students develop conceptual self-awareness.
- Poi et al. (2008) developed a software package in science, 'Physhint' to help students by providing them with structured hints at appropriate intervals in their problem solving.

- Wang, Chang and Li (2008) developed an automated grading scheme to assess science students' performance in undertaking creative problem-solving tasks.
- Hoban and Littlejohn (2009) describe how Year 9 students were required to select a problem area about the Sovereign Hill goldfields. They used digital cameras, mobile phones and web sources to create a Photo Story about their chosen problem.
- Stiler (2007), in a similar vein, explores the potential use of MP3 players for students to undertake problem-solving in lower secondary schools.

However, it is also evident that the problem solving, inquiry or discovery mode is not a popular approach to teaching with all teachers (Cruickshank, Jenkins & Metcalf, 2012). Some of the purported disadvantages include:

- it takes an inordinate amount of class time and out-of-school time compared with other forms of instruction
- many students prefer passive learning approaches
- it can lead to embarrassing situations if controversial topics are examined within local communities
- it is difficult to assess compared with traditional approaches.

Inquiry, problem solving and discovery can be largely non-structured, using various concrete materials with lower grades or it can extend to relatively rigorous testing out of specific hypotheses with older students. The typical processes of inquiry involve:

- examining an issue/problem/dilemma and posing questions such as
  - Why should we investigate this?
  - What do we already know?
  - What do we want to find out?
- deciding directions and forming hypotheses and posing questions such as
  - What would happen if ...?
  - How can we explain ...?
  - What questions do we need to ask?
- organising the study and the team and posing questions such as
  - How are we going to conduct our inquiry?
  - What type of information do we need and how do we find and collect it?
- finding out and posing questions such as
  - How are we going to find out about this?
  - Who, what, where has/is the information?
- sorting out, collecting and processing the data and posing questions such as
  - What similarities and differences can we see?
  - What connections can we see?
- drawing conclusions and communicating them to others and posing questions such as
  - What can we now say about ...?
  - What general conclusion can we make?
- considering social action and posing questions such as
  - How can we contribute to decisions made about ...?
  - What should be done about this?

Inquiry, problem solving and discovery can be very rewarding experiences for teachers and students and computer software is enabling students, individually and in small groups, to proceed with exciting inquiry projects (Travers, 1997; Arends, 2012; Frid, 2001).

Role-playing and simulation games

Role-playing and the use of simulation games (simulations merged with game rules) can be very powerful ways of exploring values and interpersonal issues. This instructional mode was popularised in the Humanities and Social Sciences, but has been used widely in recent years across a range of subjects.

Role-plays are usually teacher-directed and may involve a limited number of students playing or miming a specific role for a short period of time, usually 2–15 minutes. Simulation games may be commercial products or teacher-developed. Simulation games are usually classified into board games (such as Monopoly) and role-playing games (including designated role-players, scenarios, procedures and win-criteria).

Although there is not substantial research evidence to demonstrate that simulation games are more effective than other instructional strategies, there is considerable support for them as a teaching tool, from both teachers and students. The common advantages advanced include that they:

- allow students to get fully involved in learning
- encourage self-development in students
- enable students to communicate more confidently
- allow students to see events occurring over accelerated time
- allow concepts to be more easily understood
- provide students with immediate reinforcement
- reduce classroom discipline problems
- enable students to become more aware of their own values.

However, others argue that simulation games are very time-consuming in terms of preparing and playing them, and that they can become very competitive.

Games (board and role-playing versions) do require careful preparation and supervision by the teacher. Some particular points for the teacher to note include:

- If there will be excessive noise or movement of furniture, it is prudent to advise other teachers in advance.
- Provide each student with a summary sheet describing the purpose of the simulation game, the role-players and the scenario.
- Develop a simple system for casting the players or participants.
- Provide the necessary recording materials in advance to the players, such as blank paper, marker pens, role cards and recording sheets.
- Once the simulation game has commenced, do not interrupt unless absolutely necessary.
- Once the simulation game has concluded, ensure that sufficient time is available for debriefing. Questions that students need to reflect on include:
  - What happened?
  - What decisions were made and why?
  - What were your greatest frustrations or successes?

Computer-based simulation games which make good use of colour, graphics, sound and action are highly motivating for students. They have the added advantage that a student can interact with the computer at different time periods without interrupting others, which negates the argument that this way of teaching is very time-consuming.

There are many published accounts of computer-based simulation games, especially in Mathematics and Science. A sample follows, providing you with ideas for your own teaching, but perhaps more importantly, ideas about the range of resources available to you and your students.

- Chang et al. (2008) compared the use of computer-based simulations with traditional laboratory learning in the teaching of Physics. Learning achievements were significantly better with the computer-based simulations.
- Yaman, Nerdel and Bayrhuber (2008) studied the use of computer-based simulations in Science and concluded that they were only successful if the teacher provided instructional support through worked-out examples.
- Ke (2008) used computer-based simulation games in a summer Maths program for 4th and 5th graders. He concluded that these games provided significant cognitive Maths achievement and metacognitive awareness.
- Kim, Park and Baek (2008) used a commercially available computer-based simulation game, 'Gersang', with lower secondary students in History to develop meta-cognitive strategies. They concluded that the problem-solving abilities of students were greatly improved by playing the simulation game.
- Wall and Ahmed (2007) used a computer-based simulation game, MERIT, to develop lifelong learning skills.
- A number of researchers have examined new possibilities for computer-based simulation games such as incorporating animation in Maths computer games (Taylor, Pountney & Baskett, 2006) and the use of teacher-created video games to teach genetics (Annetta et al., 2009).
- Kebritchi and Hirumi (2008) studied the pedagogical foundations of 22 computer-based simulation games. They concluded that where games were based on established learning theories, they were more successful with students.

Project-based learning and problem-based learning

According to Katz and Chard (2000) a project is an in-depth investigation of a topic worth learning more about, undertaken by a small group of students within a class, the whole class or individual students. The key feature of a project is to focus on finding out answers to questions posed by the teacher or by the students as, according to Larmer and Mergendoller (2010), a good driving question captures the heart of the project in clear, compelling language. Katz and Chard (2000) note that doing projects enables students to make genuine choices, including choices of when to carry out the tasks, where they want to work and who they work with on the project.

Independent self-directed study

Independent study activities can take various forms, but the common element is that the focus of responsibility for learning changes from the teacher to the student. 'Independence' is the key term, although the amount of independence given to students will depend on their level of maturity, commitment and ability (Cruickshank, Jenkins & Metcalf, 2012).

An independent study usually involves individual students fulfilling contracts or doing projects that last over several days or even weeks, and which are largely unsupervised. Examples include individualised learning kits (for example in reading or spelling) when students proceed in a set sequence through learning tasks at an individual pace and according to their level of proficiency.

In ideal situations, independent learning by students is strongly supported, especially if this entails students:

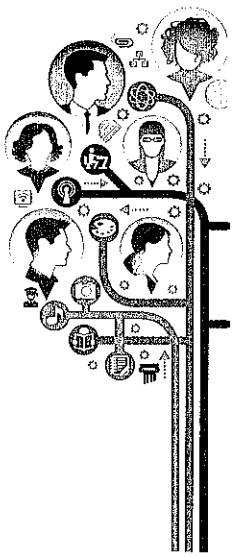
- doing activities that are worthwhile and meaningful to them
- disciplining themselves to do the work.

In actual practice it is likely that most students will need some assistance with their self-directed studies. Gage and Berliner (1992) suggest that students can be categorised at three levels: those at the level of guided study need considerable assistance; those at the cooperative planning level can direct their own activities but need assistance from time to time; those at an individual pursuit level can already define topics – they can make decisions, locate resources and keep to deadlines.

To assist students undertaking independent studies, the teacher can facilitate the process by:

- ensuring that resources are available for the projects to be undertaken
- including independent study activities along with non-independent modes of instruction for all students so that they gain in confidence in this approach
- providing explicit directions or a list of steps to be covered.

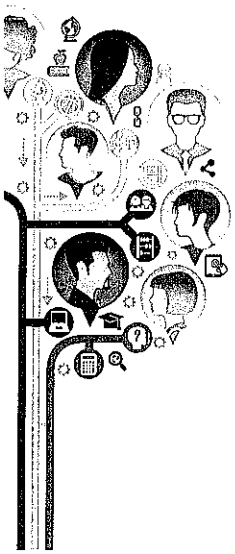
CONCLUDING COMMENTS



Teachers and students both benefit from initiating and experiencing a range of approaches to teaching. If a teacher is pedagogically flexible is it likely that his or her students will have a flexible approach to learning and draw on and develop many skills and capacities to enable them to achieve success in their learning. How a particular approach to teaching is used in a classroom is dependent on a number of factors and there will be many variations and hybrids from an idealised mode. Further, it is a learning process for all participants and early experimentations with different approaches are likely to cause discomfort – for both the teacher and the students. Yet it is essential that a combination is used to ensure that all students are exposed to at least some approaches that are closely amenable to their interests and preferred ways of learning.

KEY ISSUES RAISED IN THIS CHAPTER

1. The use of the term pedagogy is important because it gives a wider and more creative orientation to teaching and learning.
2. It is crucial for teachers, where possible, to match up their teaching styles with students' learning styles.
3. The current impact of standards and testing is likely to cause teachers to use a narrow range of teaching and learning approaches.
4. Computer technology can benefit classroom instruction.
5. A number of teaching and learning approaches were detailed including expository talks and lectures, practice drills, directed questioning, direct instruction, demonstrations, online teaching, constructivism, discussion, cooperative learning, problem solving and inquiry, role-playing and simulations, project-based learning, and independent self-directed study.



Reflecting and exploring

1 When deciding which approach to teaching to take, what, in your view, is the relative importance of teacher versus learner needs?

2 'Students are not failing because of the curriculum. Students can learn almost any subject matter when they are taught with methods and approaches responsive to their learning style strengths' (Dunn, 1990, p. 15). Do you support the view that students have dominant learning styles? Should students be 'matched' with modes of instruction that suit their learning styles? Give details of how this might be achieved.

3 'Teaching cannot simply consist of telling. It must enlist the pupil's own active participation since what gets processed gets learned' (Tomlinson & Quinton, 1986). What approaches to teaching can a teacher use to encourage more active student participation?

4 Discuss how technology can enrich teaching and learning. What are some of the challenges for teachers and students in using computers in classrooms?

5 'Students need enough freedom to become cognitively active in the process of sense making, and students need enough guidance so that their cognitive activity results in the construction of useful knowledge' (Meyer, 2004, p. 16). Is Meyer (2004) suggesting that both freedom and guidance are essential? Explain using examples.

6 What do you think students learn when they work together?

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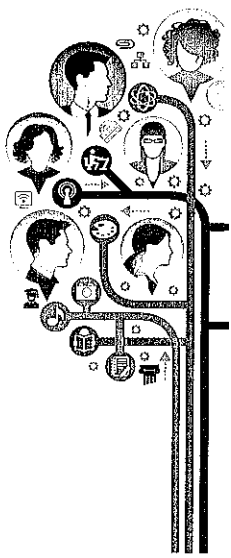

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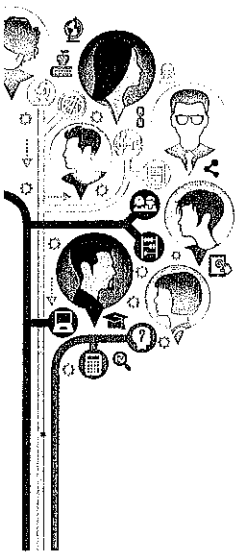

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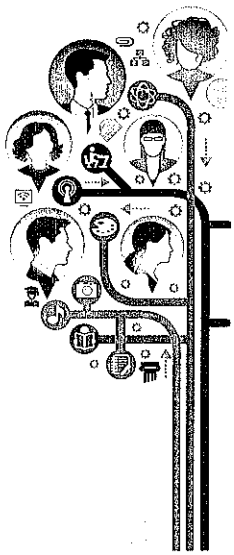

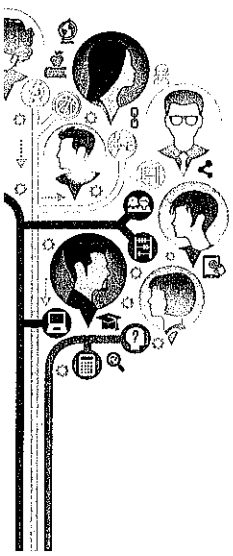

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