Peter Westwood

What teachers need to know about

Teaching methods

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Preface

A teaching method is characterised by a set of principles, procedures or strategies to be implemented by teachers to achieve desired learning in students (Liu & Shi, 2007). These principles and procedures are determined partly by the nature of the subject matter to be taught, and partly by our beliefs or theories about how students learn.

In the first half of the twentieth century, the dominant form of pedagogy was almost entirely teacher-directed instruction together with heavy use of textbooks, drill and practice. The focus was clearly on mastery of subject matter and little thought was given to how best to facilitate such learning in students. In every lesson, teachers tended to lecture and demonstrate first, then set their students related deskwork to do. The more imaginative teachers encouraged a little discussion, but in general 'a good class was a quiet class'. Students' deskwork was later marked and returned, and students were graded on their results. The same approach was used to teach almost all subjects in the curriculum. No one questioned whether the method was effective; it was the tradition.

By the 1950s, teachers were being encouraged to use a 'project approach' and to engage students in more group work. Some teachers resisted even these modest changes. But slowly over the next decade more innovative approaches did appear, with activity-based methods recommended in the primary years, and the use of the (then) 'new' medium of educational television and film. Teachers noticed that children showed greater motivation and interest when teaching methods were varied.

The period from the 1970s to 2000 saw a sudden growth in educational research exploring the effects of different approaches to teaching. Simultaneously, research in the field of psychology was continuing its investigations into how humans learn – how they acquire knowledge, how they process information, how they develop skills and strategies, how they think and reason. Gradually, evidence from these two separate fields of

research has started to coalesce. Now, the appropriateness and efficacy of a particular teaching method can be considered in relation to the type of learning it is supposed to bring about, and in relation to characteristics of the learners. Research into methods is, of course, continuing; and debates arising from different theories of learning and how these impact upon methods are still occupying the pages of very many educational psychology journals. Unfortunately, the average teacher is not in a position to access such journals, so there remains a large gap between research evidence and teachers' awareness of effective methodology. This text is a small step towards bringing the current evidence and the debates into the hands of all teachers.

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PETER WESTWOOD

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one

Conceptualising learning and teaching

KEY ISSUES

- **The nature of teaching:** A leading question in education today concerns the role of the teacher. Should teachers directly instruct their students? Or is the teacher's role simply to encourage and support students as they learn and construct knowledge for themselves?
- **Constructivist beliefs:** Constructivists believe that traditional didactic teaching represents a largely unsuccessful attempt to transmit knowledge in a predigested form to learners. They believe that learners must construct knowledge from their own activities. Is this true?
- **Instructivist beliefs:** In contrast to the constructivists' view of learning, instructivists believe that direct teaching can be extremely effective. Is this true?

What is 'teaching'? Most dictionaries favour a simple definition such as 'the imparting of knowledge or skill; the giving of instruction'. Similarly, 'instruction' in this context is usually defined as 'furnishing others with knowledge and information, especially by a systematic method'. It is only in the last decade that these traditional definitions have been challenged and the role of a teacher somewhat redefined due to new beliefs about how learning occurs, and the optimum conditions under which it takes place. Davis (1997) suggests that the design and selection of teaching methods

must take into account not only the nature of the subject matter but also *how* students learn.

In recent years the central debate surrounding teaching and learning has hinged on the relative merits of 'constructed knowledge' versus 'instructed knowledge' (e.g., Hmelo-Siver et al., 2007; Kirschner et al., 2006; Rowe, 2006; Scruggs & Mastropieri, 2007). On the one hand, *constructivists* believe that the very nature of human learning requires that each individual create his or her own understanding of the world from firsthand experience, action and reflection, not from having predigested information and skills presented by a teacher and a textbook (Zevenbergen, 1995). On the other hand, *instructivists* believe firmly in the value and efficacy of direct and explicit teaching, particularly for achieving certain goals in education. They consider that it is not only possible but also highly desirable that learners follow a structured course in which important information and skills are presented in an orderly and sequential manner, practised, assessed and reviewed regularly.

To some extent, the constructivist and instructivist perspectives are represented in the two contrasting teaching approaches that Prosser and Trigwell (2006) identify in their instrument, Approach to Teaching Inventory (ATI). One approach is clearly student-focused and primarily concerned with bringing about deeper conceptual understanding and change in students. The other is more teacher-focused and concerned with effective transmission of information and skills from teacher to learner. These two approaches are also referred to in the current professional literature as 'minimally guided instruction' and 'explicit instruction' respectively (Kirschner et al., 2006). Some writers even see the two approaches as simply being what we tend to call 'progressive methods' versus 'traditional didactic teaching' (e.g., Adkisson & McCoy, 2006).

From the point of view of busy practising teachers, it is very unfortunate indeed that almost all the worthwhile current debates on methods of instruction are being conducted in psychology journals rather than publications that teachers can easily access and read. To compensate, this chapter will provide coverage of the key issues involved in the methods debate. Understanding the rationales underpinning learner-centred and teacher-centred approaches is essential for guiding the selection of effective teaching methods for use in our classrooms.

Constructivism

Constructivism is a theory about human learning, not specifically about a method of teaching (Rowe, 2006). It can be argued that constructivist principles may be implemented through several different approaches to teaching, as we will see later.

Since the 1990s, constructivism has spread as a strong influential force, shaping education reform across many areas of the school curriculum and spawning many new learner-centred approaches to teaching. It is certainly the major influence on the content presented in university methodology courses for trainee teachers at this time.

The underlying principles of constructivism can be traced back to the learning theories of John Dewey (1933), Jean Piaget (1983) and Jerome Bruner (1961). In various ways, these pioneers stressed the essential role of activity and firsthand experience in shaping human learning and understanding. Bruner, for example, devised the hybrid science and social studies course known as *Man: A course of study* (MACOS), involving children in hands-on discovery, problem solving, inductive thinking and reasoning. These early theorists also recognised that learning can only occur to the extent that new information links successfully with a learner's prior knowledge and experience. Other pioneers, such as the Russian psychologist Lev Vygotsky (1962, 1978), added the view that learning is greatly enhanced by collaborative social interaction and communication – in other words, discussion, feedback and sharing of ideas are powerful influences on learning. Vygotsky's view has been termed 'social constructivism' to differentiate it from Piaget's view that is often called 'cognitive constructivism' or 'structuralism', and is less concerned with language and social interaction (Santrock, 2006). Principles of constructivism have been articulated clearly by writers such as von Glasersfeld (1995) and DeVries et al. (2002).

There is a natural commonsense appeal to the notion of learners constructing their own knowledge through their own endeavours, because most of what individuals learn in everyday life clearly comes from personal discovery and experience, not from instruction. Walter Dick (1992), an instructional design expert, suggested that the constructivist perspective meshes well with the current humanistic and developmental orientation

evident in most of our schools. There is no doubt that in its various guises (e.g., whole language approach, process writing, problem-based learning, inquiry approach and discovery method) the notion of a learner-centred constructivist approach has been readily accepted without question by government departments of education, university departments of methodology and teaching practice, and by many teachers. In recent years constructivism has been virtually the only view of learning presented to trainee teachers in colleges and universities (Farkota, 2005; Rowe, 2006; Westwood, 1999).

Constructivism has brought with it a whole new set of terms – learning has become 'knowledge construction'; a class of students has become a 'community of learners'; 'learning by doing' has become 'process approach' or 'experiential learning'. In addition, giving students support in the form of hints and advice has become known as 'scaffolding'. Key words in connection with curriculum are 'authentic', 'meaningful' and 'developmentally appropriate'. Typical goals for constructivist classrooms are to help children become inquisitive, inventive and reflective, and to encourage them to take the initiative, think, reason and be confident to explore and exchange ideas with others (Project Construct, 2004).

Active learning

Mayer (2004, p. 14) comments that, 'As constructivism has become the dominant view of how students learn, it may seem obvious to equate active learning with active methods of instruction'. The constructivist view favours teaching methods that focus primarily on learners playing the active and major role in acquiring information and developing concepts and skills while interacting with their social and physical environment. The role of the teacher becomes one of facilitator and supporter, rather than instructor. The importance of social interaction, language and communication is recognised in constructivist classrooms and therefore much group activity, discussion and cooperative learning is encouraged.

A pervading assumption of constructivist rationale is that children are self-motivated and self-regulating beings who will acquire the fundamental skills of reading, writing, spelling, calculating and problem solving as by-products of engaging in, and communicating about age-appropriate, meaningful activities every day. Direct teaching of these fundamental

skills is therefore frowned upon, and activities such as drill and practice are dismissed as boring and meaningless rote learning.

Deconstructing constructivism

Given that constructivist philosophy is exerting such a strong influence on education policy and classroom practice, it is important to test some of its basic assumptions. For example, is it really true that learners can only construct meaning for themselves? Is it not possible for knowledge and meaning to be conveyed directly from one individual to another? And is direct teaching not, at times, the most effective method of presenting new information and skills, particularly to young and inexperienced learners? Creemers (1994) made the simple but pertinent comment that if you want students to learn something, why not teach it directly?

Is it true that knowledge cannot be conveyed directly to learners?
Presenting knowledge directly to a learner does not prevent the individual from engaging in the mental processes of making meaning. Indeed, clear presentations of new information may greatly facilitate that process. On the important role of the teacher as instructor, Yates and Yates (1990) observed that while learning does indeed occur through engagement with resources such as textbooks, articles, models, diagrams, computer programs, apparatus and films, learning *also* involves, '… exposure to a human being who organises and presents new knowledge to be assimilated and hence reconstructed in the mind of the student' (Yates & Yates, 1990, p. 253).

Mayer (2004) suggests that many constructivists stress the importance of learners' *behavioural* activity in acquiring personal knowledge, while overlooking the essential role of *cognitive* activity. It is perfectly possible to stimulate cognitive activity by direct teaching through verbal and visual means, not necessarily by physical activity. In other words, it doesn't necessarily require 'hands on' to switch 'minds on'; clear and direct explanations and presentations can stimulate thinking. Pressley and McCormick (1995) believe that good instruction that includes modelling and high-quality, direct explanation involves students in a great deal of mental activity. They argue that modelling and explanation can stimulate knowledge construction. In a methodology text on the role of teachers' explanations Wragg and Brown (1993, p. 3) even define explaining as

'giving understanding to another'. It is possible that a clear explanation to a group of students helps minimise differences in their prior knowledge about the given topic, and thereby reduces the potential for misconceptions or learning difficulties to arise.

Are methods based on constructivist principles suited to all areas of learning?

A second issue worth addressing concerns the implication that constructivist approaches can be (and should be) applied for all areas of the curriculum. According to Walter Dick (1992), some advocates make it appear that the theory applies to all domains of human learning. He raises the legitimate query, 'What are the boundaries of the theory? And, is it really a theory, or is it an instructional strategy for a particular type of learning outcome?' (p. 96). For example, a constructivist approach to problem solving in mathematics or hypothesis testing in science makes good sense. A constructivist 'find-out-for-yourself' approach to basic literacy and numeracy learning does *not* make good sense. As Yates (1988, p. 8) has observed, '… requiring a child to actively discover his or her way toward a basic knowledge of literacy and numeracy is to confront that child with tasks of immense difficulty. On the other hand, exposure to good direct teaching will enable the child to develop a more substantial knowledge base that will bootstrap the child's thinking processes in subsequent situations both in and out of school'.

Rather than being generally applicable to all types and levels of learning, it is conceivable that constructivist strategies are actually important at a particular stage of learning. For example, Jonassen (1992) presented a three-stage model of knowledge acquisition, namely:

- Stage 1 – initial knowledge acquisition
- Stage 2 – advanced knowledge
- Stage 3 – expertise.

He supports the view that initial knowledge acquisition may well be best served by direct teaching and that advanced knowledge acquisition leading to expertise may benefit most from a constructivist approach. For example, in the domain of literacy teaching, establishing the basic skills involved in early reading, such as word identification and decoding, may best be served by direct teaching, while higher-order critical reading and deep comprehension

may represent advanced knowledge and expertise constructed upon the firm foundation created by the earlier direct teaching. Similarly, advanced knowledge and expertise required for higher-order mathematical problem solving can best be developed on a firm foundation of basic number skills and number sense developed by earlier direct teaching.

Are constructivist approaches ideal for all learners?

Constructivist approaches that use minimal instructional guidance require that learners be self-motivated, capable of thinking and reasoning, and in possession of sound independent learning skills. Unfortunately, many students in our schools do not meet these requirements and therefore become lost and frustrated in unstructured learning activities. Pressley and McCormick (1995) have observed that for many of these students, unstructured discovery-type activities where learners must independently acquire or construct essential information are very inefficient indeed for achieving the desired learning. They require far longer than it would take to teach the same knowledge to students using direct explanation. There is evidence that such students make much better progress when they are taught explicitly and directly (e.g., de Lemos, 2004; Ellis, 2005; Mastropieri et al., 1997; Swanson, 2000). In particular, students with learning difficulties, poorly motivated students and students from disadvantaged backgrounds appear to acquire basic academic skills more rapidly and firmly when taught by explicit methods involving a great deal of teacher modelling and guided practice.

It is also pertinent to point out that minimal guidance from teachers is not necessarily perceived as acceptable by some students who are mature enough to know when their needs and expectations are not being met. For example, Delpit (1988, p. 287) quoted one student as saying: 'I didn't feel she was teaching us anything. She wanted us to correct each other's papers and we were there to learn from her. She didn't teach us anything, absolutely nothing'. Similarly, Vaughn et al. (1995) reported that most students in their study wanted more, not less, direction from the teacher, especially when dealing with difficult material.

It is clear that using a classroom approach based firmly on constructivist principles in no way guarantees that all students in the class will construct identical knowledge about a given topic. A learner can construct misconceptions as well as accurate conceptions. How well a learner makes

sense of new information (and contributes usefully to collaborative group work) depends greatly on his or her prior knowledge and experience; and these two prerequisites differ greatly from one learner to another. This is why the common statement is made that 'one-size instruction does not fit all', be it student-centred activity or direct instruction.

Are constructivist approaches compatible with human cognitive processing?

There is a growing body of information from research on 'cognitive load theory' (CLT) that raises doubts about the efficacy of unstructured and unguided discovery-type activities. CLT research is particularly concerned with tasks where learners are often overwhelmed by the amount and diversity of information that needs to be processed and remembered simultaneously – as can easily happen with discovery or problem-based learning situations (Paas et al., 2004). Researchers in CLT are suggesting that learning activities with minimal guidance from teachers are less effective than guided instruction because they place unreasonable demands on learners' information processing capabilities, in particular on working memory (Kirschner et al., 2006). Paas et al. (2004, p. 1) explain the problem in these terms:

> … performance degrades at the cognitive load extremes of either excessively low load (underload) or excessively high load (overload) [and] under conditions of both underload and overload, learners may cease to learn.

With reference to overload, Kirschner et al. (2006, p. 80) even observe that, 'As a consequence, learners can engage in problem-solving activities for extended periods and *learn almost nothing*' [emphasis added]. While all learning activities and tasks do involve some degree of intrinsic cognitive load, experts in this area are recommending that instructional materials and methods should try to minimise this load by breaking tasks down into manageable steps and providing sufficient support for learning.

Critics of this CLT view suggest that while the theory of cognitive overload may well hold good for totally unguided discovery and exploratory methods, it is not valid for most problem-based or inquiry approaches in use today, because teachers do in fact provide learners with necessary support and guidance (scaffolding) as they engage in learning activities (Schmidt et al., 2007).

LINKS TO MORE ABOUT CONSTRUCTIVISM

- For a more detailed explanation of constructivism in the classroom, see *Constructivism as a paradigm for teaching and learning*. Available online at: http://www.thirteen.org/edonline/concept2class/constructivism/index_sub2.html
- Some good comments regarding implementation of constructivist principles are available online at: http://leo.oise.utoronto.ca/~lbencze/Constructivism.html
- http://www.teach-nology.com/currenttrends/constructivism/classroom_applications
- Interesting descriptions of a curriculum designed on constructivist principles (Project Construct) are available online at: http://www.projectconstruct.org/misc/pdf/framework/ec/chapter1.pdf
- See also a paper from *The Constructivist*, 17, 1, 2006, at: http://www.odu.edu/educ/act/journal/vol17no1/cunningham.pdf
- Cognitive Load Theory: Wikipedia has an excellent summary of the development and implications of cognitive load theory. Available online at: http://en.wikipedia.org/wiki/Cognitive_load

Direct teaching

Direct teaching manifests itself in various forms and is associated with several different descriptors; for example, explicit instruction, systematic instruction, direct instruction (DI), active teaching and teacher-directed approach. All these forms of direct teaching share a set of basic principles including the setting of clear objectives for learning, systematic instruction that progresses from simple to more complex concepts and skills, ongoing monitoring of students' progress, frequent questioning and answering, re-teaching of content when necessary, practice, application and assessment.

Direct teaching is based on a firm belief that learning can be optimised if teachers' presentations (and the steps in learning) are so clear that they eliminate all likely misinterpretations and facilitate generalisation (Ellis, 2005). To this degree, direct teaching is a form of explicit instruction that attempts to present information to learners in a form they can easily access,

understand and master. It is argued that direct teaching procedures are based upon behavioural views of learning where modelling, imitation, practice, shaping and reinforcement are key ingredients for helping learners master the objectives set for each lesson. Hall (2002, n.p.) states that, 'Explicit instruction is a systematic instructional approach that includes a set of delivery and design procedures derived from effective schools research merged with behavior analysis'.

The generic model of direct (or explicit) teaching was influenced by Rosenshine's (1986) seminal analysis of effective instruction in which he identified the six major components of teaching that appeared to be associated most clearly with positive academic achievement in students (see also Rosenshine & Stevens, 1986). The six components are:

- daily review
- clear presentation of new material
- guided practice by students
- immediate correction and feedback from teacher
- independent practice
- weekly and monthly reviews.

Although direct teaching takes many shapes and forms (see chapter 2), the model presented above is particularly associated in the United States of America (USA) with Hunter (2004). Her approach to lesson planning, delivery, and assessment has been quite influential in many teacher education programs in that country. Trainee teachers (and others) appreciate the effective structure that it provides for operating successful lessons.

LINKS TO MORE ABOUT EXPLICIT TEACHING

- For information on explicit teaching check the material available online at: http://olc.spsd.sk.ca/DE/PD/instr/strats/explicitteaching/index.html. This website also has valuable notes and comments on a wide range of teaching strategies.
- See also: http://www.bayvieweduc.ednet.ns.ca/Smoran/Reader'sworkshop/explicit_teaching_steps.htm

http://www.bayvieweduc.ednet.ns.ca/Smoran/Reader'sworkshop/explicit_teaching_steps.htm

- For the Madeline Hunter Model of direct teaching see AdPrima on:
  http://www.adprima.com/direct.htm and
  http://www.humboldt.edu/~tha1/hunter-eei.html#eei
  Also at:
  http://www.highlandschools-virtualib.org.uk/ltt/inclusive_enjoyable/direct.htm

Direct Instruction (DI)

The most formalised model of direct instruction was devised by Engelmann at the University of Oregon, together at various times later with Becker, Carnine, Silbert, Gersten, Dixon and others. This highly teacher-directed form of curriculum delivery adopted the capitalised form for its title – *Direct Instruction* (DI). The approach was originally associated with the commercially produced program called DISTAR which presented step-by-step instruction in phonics, language and number skills for disadvantaged and at-risk children. More recently, published DI materials have been expanded to cover writing, spelling, reading comprehension, mathematics and problem solving for a much wider age and ability range.

DI is a fast-paced method of teaching that provides very high levels of interaction between students and their teacher. Instructional procedures are based on clear objectives, modelling, high response rate, reinforcement, error correction, criterion-referenced performance and practice to mastery. The beliefs underpinning DI are that (a) all students can learn if taught correctly; (b) lesson content must be reduced to teachable and learnable steps; (c) basic language, literacy and numeracy skills must be mastered thoroughly to provide a firm foundation for future learning.

DI sessions follow a standard format. Children are seated in a semi-circle facing the teacher. The teacher may use the whiteboard, overhead projector, big book, or other methods to present visual information (e.g., alphabet letters, words, numbers). Children are taught in small groups, based on ability. The teacher gains and holds children's attention as he or she conducts the lesson. Scripted presentation ensures that all steps in

the teaching sequence are followed and that all questions and instructions are clear. Children actively respond to the frequent questions or prompts, either as a group or individually, with approximately 10 responses elicited per minute. Teacher gives immediate feedback and correction. Rather than requiring each child to 'raise a hand' to reply, much choral responding by the group is used as a strategy for motivating students and maximising participation.

Is direct instruction appropriate for all instructional purposes?

Ormrod (2000) suggests that direct instruction is most suitable for teaching basic information and skills that are well defined and need to be mastered in a step-by-step sequence. Research indicates that direct teaching can be a highly effective technique for this purpose, leading to substantial gains in achievement and increases in students' self-efficacy. Rosenshine's (1986) original description of explicit instruction indicated that the approach was particularly effective for teaching mathematical procedures and computation, word recognition and decoding strategies, science facts and concepts, social science facts and concepts, and foreign language vocabulary. More recent research has confirmed the success of the direct approach for teaching the early stages of essential literacy and numeracy skills (e.g., Adams & Engelmann, 1996; Farkota, 2003; Swanson, 2000; White, 2005). The recommended use of direct instruction has now been extended beyond mastery of basic information and skills to the explicit teaching of cognitive strategies; for example, students are taught strategies for comprehending and summarising text, planning and composing written assignments, and solving mathematical and other problems (e.g., Chalk et al., 2005; Graham & Harris, 2005).

Direct instruction is, of course, much less appropriate for achieving affective and social goals in education, such as those covering emotions, beliefs, values and attitudes. Other approaches are also necessary for fostering students' creativity, initiative and critical thinking.

What problems are associated with direct instruction?

Many teachers, particularly in Australia where constructivist influences are strong, react very negatively towards any extreme form of direct teaching, claiming that it is much too prescriptive, too highly structured, too rapidly

paced, and with too much emphasis on basic skills. For example, with the pure form of DI they are uncomfortable with the notion of following a script for teaching each lesson, and they claim that DI allows very little opportunity for a teacher or the students to be creative. The highly structured form of DI has gained more support in special education and remedial teaching contexts than in regular classrooms, despite its proven efficacy.

Unlike the more generic forms of direct teaching, the formal version of DI is not an approach that can simply be adopted and adapted by a teacher as part of his or her repertoire of teaching methods. To use the published forms of DI, a teacher requires specific training. The teacher's school also needs to make a firm commitment to the implementation of the approach across all classrooms. The small-group instruction has implications for staffing, and also necessitates major restructuring of the timetable so that children can go to their appropriate ability group for sessions each day.

LINKS TO MORE ABOUT DIRECT INSTRUCTION

- Schug, M. C., Tarver, S. G., & Western, R. D. (2001). Direct Instruction and the teaching of early reading. *Wisconsin Policy Research Institute Report*, *14*, 2, 1–31. Available online at: http://www.wpri.org/Reports/Volume14/Vol14no2.pdf
- Useful material and suggestions for implementing DI can be found at the Fairfield-Suisan Unified School District website at :http://ww4.fsusd.k12.ca.us/education/PLC/ResearchBased-DI.html

Interactive whole-class teaching

A much less structured form of direct teaching – interactive whole-class teaching – has gained somewhat greater acceptance, particularly in the United Kingdom and some other countries. Studies of teaching methods used in countries where students do extremely well in international surveys of achievement (e.g., Hungary and Japan) seem to indicate that the teachers in those countries employ interactive whole-class teaching methods widely and effectively.

This approach, as with other forms of direct teaching, aims to generate a very high level of attention, engagement and active participation by students through establishing a high response rate to teacher's questioning and prompting. The teacher may begin the lesson by presenting information using an explanatory or didactic approach, but then students are expected to enter into dialogue and contribute their own ideas, express their opinions, ask questions, and explain their thinking to others (Dickinson, 2003; Reynolds & Farrell, 1996). Learning is not achieved here by adopting a simplistic formula of a mini lecture to the class followed by 'drill and practice', or by expecting students to teach themselves from books or other materials. Learning occurs because students are engaged cognitively in processing and using relevant information, expressing it in their own words and receiving feedback.

Jones and Tanner (2005) have remarked that there are differences among teachers in how they interpret the concept of interactive teaching and how they accommodate it into their own style. To be effective, a teacher needs to be very skilled at drawing all students into the lesson by encouragement, interest and direct questioning. Teachers also need to be adaptable and able to 'think on their feet' in order to respond to, and capitalise fully on, students' contributions. When engaged in interactive teaching, some teachers do not seem to recognise the value of encouraging 'choral responding' (all students answering together sometimes) and what should be a very brisk rate of progress through the lesson may be slowed unintentionally by asking individual students to raise a hand if they wish to answer a question or make a contribution.

Interactive whole-class teaching has been recommended in government guidelines in the United Kingdom as a possible means of raising students' attainment levels in basic literacy and numeracy (e.g., DfEE, 1999). While containing the main ingredients of other forms of direct teaching, this interactive model is not constrained by scripted lessons and can be much more easily accommodated into teachers' existing teaching styles. However, some teachers still have difficulty moving in this direction (Hardman et al., 2003; Hargreaves et al., 2003).

The following chapter explores the connection between methods described in this chapter and their appropriateness for teaching particular types of subject matter.

LINKS TO MORE ABOUT INTERACTIVE WHOLE-CLASS TEACHING

- Smith, K., Hardman, F., Wall, K., & Mroz, M. (2004). Interactive whole-class teaching in the National Literacy and Numeracy Strategies. *British Educational Research Journal, 30, 3*, 395–412. Available online at: http://www.latrobe.edu.au/educationalstudies/assets/downloads/berj303.pdf
- London Borough of Barking and Dagenham: *A coherent pedagogy for secondary schools*. http://www.bardaglea.org.uk/pedagogy/practice-implications.html and http://www.bardaglea.org.uk/pedagogy/practice-principles.html
- Helpful advice on operating whole-class interactive lessons (particularly the use of questioning within such lessons) available online at: http://www.cchsonline.co.uk/teep/etb/teepmodule3interactiveteaching.pdf

two

Direct teaching methods: Suitability for purpose

KEY ISSUES

- **A teaching method must be selected for its suitability in a given context:** No single method of teaching can be used for all types of subject matter or for achieving all educational goals.
- **Under what conditions are direct methods appropriate?** Direct teaching is advocated for the beginning stages of learning new information, skills or strategies.
- **Strengths, weaknesses and applications of direct teaching:** Direct methods have much to offer if used in appropriate ways to achieve appropriate goals.
- **Optimising and enhancing the effects of teaching methods:** All teaching methods can be made more effective by attending to particular aspects of implementation.

In the previous chapter, rationales for two contrasting teaching approaches were presented – one based on constructivist principles, the other on instructivist or direct teaching principles. The emerging consensus among educational psychologists and methodologists is that we should not be asking which of the two approaches is better, but rather which approach is better for teaching what type of curriculum content. Both constructive and instructive approaches have important places in the total context of teaching

and learning, but may not be equally effective for achieving particular goals in education (Scruggs & Mastropieri, 2007). One single method of teaching cannot suit all types of learning; common sense indicates that different methods are required in order to achieve different types of learning objectives. Methods of teaching should be selected therefore according to their fitness for specific purposes (Kuhn, 2007).

Varieties of direct teaching

There is a growing consensus that direct methods are the most effective for teaching the early stages of foundation skills such as literacy and numeracy, thus preparing learners to participate productively in less structured learning situations later (Ellis, 2005). Direct teaching is also appropriate in many other contexts and can be implemented with very large groups, such as an audience of several hundred in an auditorium, or much smaller groups such as a single class of students, groups of four or five students, or even in one-to-one tutoring.

Direct teaching takes many forms, ranging from the typical chalk-and-talk or PowerPoint lecture – where students are mainly passive recipients of information – through to highly structured but interactive classroom sessions (e.g., the Direct Instruction model of Engelmann & Carnine, 1982). Regardless of the type of direct teaching being used, the teacher or instructor requires a repertoire of skills and competencies that cover:

- planning the content and method of delivery (including appropriate use of audio-visual equipment and ICT)
- managing the available time efficiently
- presenting the content in an interesting and motivating way
- explaining and demonstrating clearly
- knowing when and how to explain key points in more detail
- using appropriate questioning to focus students' attention, stimulate their thinking, and check for understanding
- dealing with questions raised by students
- evaluating students' learning and participation
- giving feedback to students.

The effectiveness of direct teaching is influenced by many factors including the clarity, charisma and motivational skills of the lecturer, the way in

which the material is organised and presented, the length of time devoted to the session, the amount of participation the students engage in, how well the content links with students' prior knowledge and experience, and the intrinsic interest and potential relevance or value of the topic.

Lectures

Naturally, constructivists are critical of lecturing as a method of imparting information to students (although it is interesting to observe that trainee teachers are often taught about constructivist principles through passive, formal lectures within their teacher education courses!). The main objection to lectures is that they imply the possibility of creating knowledge and understanding in students simply by 'talking at them'. In fact, the formal lecture is the classic example of a transmission method.

It is true that many lectures (and also teacher-directed classroom lessons) are not very effective because the lecturer or teacher does not possess some of the necessary competencies described above. However, a *well-presented* lecture can be very effective in bringing about learning. Barry (1995, p. 358) remarks:

> In terms of passivity, the process of following a lecture can be anything but passive. Students may be working hard to follow the argument, comprehend its logic, judge its validity, evaluate the facts and evidence, separate the essential from the less important, and in other ways run alongside the lecture. Indeed, if a student learns anything from a lecture, he or she has not been passive.

When is lecturing an appropriate method?

Lectures are a valid method of teaching if the main goal is to present key information to students. Lectures are appropriate in universities and in the upper levels of secondary school. In those situations, the students generally have the necessary study skills, motivation, attention span and self-management to be able to benefit from this approach. In upper primary schools and middle schools the 'mini lecture' (10–15 minutes) is appropriate for achieving some of the objectives listed below. But the younger the students, the less appropriate it is to expect sustained listening attention.

The purposes that can be achieved through lectures (or mini lectures) include:

- introducing a new topic, providing an overview, arousing interest and raising issues that can be pursued later by different methods
- bringing students up to date with recent information that is not readily available through other media
- presenting information in a quick, concise and integrated way that would otherwise take students a great deal of time to research and discover for themselves
- providing an opportunity for review and revision of course material (e.g., prior to examinations).

Good and Brophy (2008) believe that lectures, when presented efficiently and enthusiastically, can stimulate interest, challenge students' thinking, and raise issues that students will want to follow up.

When is lecture method least appropriate?

There are many occasions when lecturing is inappropriate.

- Lectures are least appropriate with young children. Their attention span for listening is fairly limited and their main mode of learning is through activity and talking.
- Lectures are inappropriate for most children with learning difficulties, mainly because their attention span tends to be limited, their ability to process and reflect upon information presented verbally is not good, their note-taking skills are minimal, and their intrinsic motivation to learn by this method is poor.
- Lecturing is inappropriate when the subject matter clearly requires hands-on processing by students.
- This form of direct teaching is inappropriate if the objectives for a course are mainly affective (dealing with development or change in feelings, emotions and attitudes) or social (requiring interaction, cooperation and communication among students).
- Lectures are also inappropriate for fostering students' creativity and initiative, although a lecture may be appropriate at times for introducing new themes and ideas that are explored later by quite different methods.

Enhancing lectures

Eggen and Kauchak (2004) suggest that many of the inherent weaknesses in formal lecturing can be overcome if the presentation time is interspersed with frequent periods of questioning and discussion. This not only helps learners participate more actively, it can also reveal to the lecturer whether the students generally understand and relate to the material being presented.

Lectures are certainly enhanced (and students' attention is more effectively held) when use is made of visual material such as slide presentations, video, OHP and PowerPoint. It is also very useful indeed to embed within a lecture activities that require students to interact with the lecture material and the lecturer by taking a moment to read a statement or a problem related to the topic, respond to it individually, or discuss it with a partner (Rumpus, 2004). The lecturer can provide a 'lecture-session response sheet' to students before the session begins. The response sheet presents activities, questions and problems that can be referred to at intervals during the lecture (for example, every 10 minutes). Taking this model a stage further, a modification of the formal lecture arrangement is to use a *lecture-discussion* format. Here the lecturer presents information for only a short period and then engages students in open discussion for a while on particular issues related to the topic. Finally, the session achieves closure when the lecturer summarises and consolidates main points from the lecture and discussion (Kauchak & Eggen, 2007).

Of course, the failure of lectures to bring about useful learning in some students may be traced back to the students themselves rather than the method. They may not pay attention to information, no matter how clearly it is presented – a typical lecture was once jokingly defined as a process whereby the written notes of the lecturer are transmitted to become the written notes of the student without having passed through the mind of either! Ormrod (2000, p. 533) states: 'The more students pay attention, and the more they engage in meaningful learning, organisation, elaboration, and so on, the more they are likely to benefit from the lectures they hear and the textbooks they read'. Effective students have developed skills that help them learn from lectures; for example, they take notes and use them later to guide their study, they highlight key points on handout sheets, they summarise and they ask questions of the lecturer and their peers.

Various writers have indicated that lectures and teacher-directed class lessons can be enhanced and made more effective by:

- Using any device before the lecture begins that will establish an *anticipatory set* in the mind of the students. Such devices include asking a provocative question, presenting a pertinent item from the news, displaying a picture or an object, or simply stating the objectives for the session – in fact, anything that effectively arouses students' interest and focuses their attention on the coming topic.
- Using *advance organisers*. An advance organiser comprises a concise set of information that prepares the scene and paves the way for new learning. It may be in the form of a set of questions, a summary statement, a set of objectives, a diagram, or table of data. By studying the advance organiser, the learner obtains important prerequisite information and gets an immediate overview of the main points in the topic to be studied. It creates a sense of direction and purpose.
- Using some form of *graphic organiser* on the whiteboard during the session. A graphic organiser may be in the form of a concept map, a web of ideas, a diagram, an incomplete table of data, or any similar device. As the session progresses, new information is added to the graphic and any relevant linkages between key points are drawn. The graphic can be used to help summarise and consolidate ideas at the end of the session. It is a visual way of building ideas as the session moves forward.

Limitations associated with lecture method

- Lectures may be too long (more than one hour), and thus exceed the attention span of even those who are interested.
- An overload of information is presented.
- Individual differences in students' prior knowledge, experience and motivation are ignored.
- It is not possible to know whether every student has understood the material.
- Some students lack confidence to ask questions or raise issues in a large group.
- AV and ICT equipment may malfunction and cause interruptions.
- Many lecturers are not particularly effective or charismatic presenters.

LINKS TO MORE ON LECTURE METHOD

- Rumpus. A. (2004). Giving effective lectures. Educational Initiative Centre, University of Westminster. Available online at: http://www.wmin.ac.uk/pdf/EffectiveLectures.pdf
- Additional information on giving lectures available online at: http://www.idea.ksu.edu/papers/Idea_Paper_14.pdf

Anticipatory set, advance organisers and graphic organisers
Online resources at:

- http://www2.okbu.edu/academics/natsci/ed/398/set.htm
- http://www.glnd.k12.va.us/resources/graphicalorganizers/
- http://www.netc.org/focus/strategies/cues.php

Classroom mini lectures

Even for children in the early years of schooling, teachers begin most of their lessons with a brief introduction that amounts to a mini lecture. By doing so, they hope to motivate the children and create an anticipatory mind-set by presenting interesting information clearly, stating the purpose of the lesson, raising some issues and outlining follow-up activities. The teacher may also demonstrate and explain a particular method or strategy for tackling the learning activities that are embedded within the lesson; for example, drawing a sketch map, calculating an average score, brainstorming ideas for a story, assembling apparatus for a science experiment, and so forth. This demonstration or modelling is done most effectively if the teacher 'thinks aloud' as he or she performs the task (Dorl, 2007). The teacher who says, 'Watch me … and listen carefully to what I tell myself as I do this job' is likely to be setting children up for success when they attempt the same task. A very important role for direct teaching is the clear modelling of effective learning strategies.

With students of all ages this introductory part of a lesson may well involve the use of appropriate visual materials. They are used to hold students' attention and help them understand and relate to the lesson content

more easily. The teacher is also likely to back up his or her statements to the class by writing relevant points on the blackboard, whiteboard, computer or overhead projector. Clear instructions for carrying out student activities in the lesson also need to be presented in written form. Finally, the teacher summarises the key points from the introduction, checks for understanding and then sets the students to work on their own tasks related to the topic.

It can be seen from the above that even if a lesson is mainly 'student-centred' in the sense that most of the available time is devoted to student activity, the introductory part of such a lesson requires direct and explicit teaching. So, to some extent, the dichotomy between teacher-centred and student-centred methods is artificial; most lessons involve a logical balance between the two approaches.

Teacher-directed lessons

After a teacher has presented the introductory part of a lesson, the students are usually required to engage in appropriate follow-up activities that enable them to work with and apply what the teacher has just demonstrated and explained. These activities may be in the form of textbook exercises, worksheets, problems from the blackboard/whiteboard, the use of manipulative materials, or an open-ended task set by the teacher. As the students begin to work, individually or cooperatively, the teacher will circulate in the classroom to check on understanding, to identify any students who need additional support and to provide feedback and encouragement. This important stage of the lesson is referred to as 'guided practice'. It is the stage at which the teacher must correct any misconceptions and provide re-teaching if necessary. A skilled teacher monitors closely the work of each and every student.

The independent practice stage may occur in this same lesson, or is implemented via homework assignments and then picked up again in the next lesson. At the independent practice stage students are expected to become confident and fluent in applying new knowledge or skill without supervision and without needing immediate feedback. As they increase in proficiency, they become capable of monitoring their own work and self-correcting errors. Even more importantly, they can transfer and generalise the new learning to other situations.

The direct teaching model also specifies that at regular intervals learning is reviewed and practised again in order to ensure maintenance.

The important role of direct teaching

It was said in the previous chapter, and is reinforced again here, that research evidence strongly supports the use of direct teaching methods for establishing basic skills required in the beginning stages of:

- reading (e.g., Ellis, 2005; de Lemos, 2004)
- spelling (e.g., Dixon et al., 2007; DuBois et al., 2007)
- writing (Pressley et al., 2007)
- elementary mathematics (e.g., Kroesbergen & van Luit, 2003; Maccini & Gagnon, 2000; Przychodzin, 2005).

It does not make sense that learners would be left to acquire these essential skills by osmosis and incidental learning. Direct teaching in the early stages opens up much better opportunities for independent learning through less structured approaches later.

It is also clear that benefits occur when students are directly taught appropriate strategies for tackling learning tasks in a systematic manner. Teachers can instruct students in *how to* learn as well as what to learn. Yates (2005, p. 684), supporting direct teaching, refers to this as 'teaching both content and process'.

Direct teaching is also the most effective way of presenting certain procedural skills and subject matter; for example, safety routines in handling equipment in laboratories and workshops, rules for games and sports events, key elements of driver education, fire drills and many other situations in which precise knowledge and correct action are clearly required.

But, direct teaching is not the ideal way of achieving some other important objectives in education. For these objectives, student-centred approaches may have more to offer.

LINKS TO MORE ON DIRECT TEACHING

For general information on direct teaching see:

- http://www.usask.ca/education/coursework/mcvittiej/methods/direct.html
- http://www.adprima.com/teachmeth.htm
- Hall, T. (2002). *Explicit instruction*. Wakefield, MA: National Center on Accessing the General Curriculum. Retrieved September 29, 2007 from: http://www.cast.org/publications/ncac/ncac_explicit.html

three

Student-centred methods: Suitability for purpose

KEY ISSUES

- **Appropriate use of student-centred approaches:** Student-centred methods are based on constructivist views of learning. In some areas of the curriculum these approaches are highly appropriate, particularly for involving students more actively in acquiring knowledge, skills and strategies.
- **Inquiry approach and discovery learning:** These approaches have much to offer in subjects such as social studies, geography, history, science, environmental education and mathematics. But students also need to use skills in these subjects that may be best taught by direct methods.
- **Problem-based, project-based and resource-based approaches:** These approaches enable teachers and learners to relate curriculum content to real-life contexts and apply skills and strategies. Usually the content is intrinsically motivating.
- **Computer-assisted learning:** CAL is becoming increasingly popular in schools. Does it produce higher achievement than other methods?

Student-centred approaches

Student-centred methods are deemed best practice in situations where the teaching objectives for the lesson include acquisition of independent study skills, greater student autonomy, working collaboratively with others, the

construction of knowledge from firsthand experience, and the application of basic academic skills for authentic purposes. Most student-centred methods are concerned not only with knowledge construction but also the development of effective learning strategies, often encompassed by the expression 'learning how to learn'. In areas such as science for example, a student-centred investigative approach is designed to give students firsthand experience of the scientific inquiry process as well as building conceptual knowledge. In student-centred approaches the *process of learning* is often considered more important than the acquisition of factual knowledge.

Teaching methods that are described as 'student-centred' are aligned with the constructivist theory of learning – although some of these methods were in operation long before constructivism emerged as a coherent theory. Student-centred approaches have been given specific titles by their creators (e.g., activity-based learning, guided discovery; inquiry approach; problem-based learning; project-based learning; situated learning) but the principles and practices associated with the methods are very similar. The subtle differences among the methods described below are usually associated with the amount of guidance and structure provided by the teacher during the learning process, and with the degree of autonomy demanded of the learners. The underlying principles for most of the methods are that:

- students should be actively involved in the learning process and intrinsically motivated
- topics, issues, or subject matter should be interesting, relevant and intrinsically motivating
- whenever possible, learning experiences should take place in real-life situations where the relevant knowledge and skills will really be needed and used (situated learning).

Student-centred approaches and the contexts in which they can be used, can be addressed under the general categories of inquiry-based methods, project-based or resourced-based learning and computer-assisted learning.

Inquiry-based methods

North Carolina Department of Instruction (2007) presents a document called 'Why Inquiry?' on its website. Referring to science education, the writer neatly encapsulates the purposes of inquiry in these terms:

> Students in all grades and in every scientific discipline should have the opportunity to ask questions, plan and conduct investigations, use appropriate tools and techniques to gather data, think critically and logically about relationships between evidence and explanations, and communicate arguments. Students who learn to question, debate, or explore acquire a deeper understanding of the world. By discovering principles, rather than just memorizing them, students learn not just what we know, but how we know it, and why it is important.

This category of teaching method includes discovery learning, problem-based learning, project work, and resource-based learning.

Discovery learning

Discovery learning is perhaps the best-known form of inquiry-based learning. It requires students to investigate a topic, issue or problem by active means, obtain pertinent information, interpret causes and effects where relevant, and arrive at conclusions or solutions (Ormrod, 2000). The method is particularly appropriate for achieving important objectives in social studies, science, geography, history, health, environmental education and mathematics. The general consensus regarding discovery learning is that it is most effective when:

- the process is carefully structured
- students have prerequisite knowledge and skills
- teachers provide any necessary support during the investigations.

Discovery learning takes many different forms, ranging from open-ended, minimally-guided investigation through to fairly tightly structured 'guided discovery' where the teacher still retains a fair degree of control (Kirschner et al., 2006; Zion et al., 2007). In methods involving open-ended discovery the teacher may provide all necessary resource materials but learners are given little or no direction for carrying out their investigations. They must decide for themselves the most appropriate method for tackling the investigation and must then reach their own conclusions from the observations they make. With this unstructured approach the outcomes are sometimes not very good, particularly for students with poor study skills and difficulties with inductive reasoning. Guided discovery, on the other

hand, has a much tighter structure. The teacher usually explains the lesson objectives to the students, provides initial input or explanation to help students begin the task efficiently, and may offer suggestions for a step-by-step procedure to find out the target information or to solve the problem. During the activities, the teacher may make suggestions, raise questions, or provide hints. This form of 'scaffolding' keeps students on track and ensures that understanding, rather than confusion, is achieved. Providing scaffolding can help to reduce the overall cognitive load associated with this form of learning (Schmidt et al., 2007). Guided discovery is generally regarded as a motivating method, enjoyed by learners (e.g., Adkisson & McCoy, 2006: Odom et al., 2007).

A typical guided discovery learning session takes the following format:

- A topic is identified or an issue is posed; for example, what can we find out about magnets?
- Teacher and students work together to brainstorm ideas for ways of investigating the topic.
- Students work individually or in small groups to obtain and interpret data.
- Inferences and tentative conclusions are drawn, shared across groups and modified if necessary.
- Teacher clears up any misconceptions, summarises the findings and helps to draw conclusions.

Advantages of guided discovery

- Students are actively involved in the process of learning and the topics are usually intrinsically motivating.
- The activities used in discovery contexts are often more meaningful than the typical classroom exercises and textbook study.
- Students acquire investigative and reflective skills that can be generalised and applied in other contexts.
- New skills and strategies are learned in context.
- The approach builds on students' prior knowledge and experience.
- Independence in learning is encouraged.
- It is claimed (but not proved conclusively) that students are more likely to remember concepts and information if they discover them on their own.
- Group working skills are enhanced.

Disadvantages of discovery methods

- Discovery can be a very time-consuming method, often taking much longer for information to be acquired than would occur with direct teaching.
- Discovery methods often require a resource-rich learning environment.
- Effective learning by discovery usually depends upon learners having adequate literacy, numeracy, independent study skills and self-management.
- Students may learn little of value from discovery activities if they lack an adequate knowledge base for interpreting their discoveries accurately.
- Although students become actively involved, they may still not understand or recognise the underlying concept, rule or principle; in other words, 'activity' does not necessarily equate with 'deep learning'.
- Young children (and older children with learning problems) often have difficulty forming opinions, making predictions, or drawing conclusions from evidence. They have major problems with inductive reasoning.
- Teachers are not necessarily good at creating and managing discovery learning environments, resulting sometimes in poor outcomes. There is evidence that teachers may develop a better understanding of the processes and problems in the appoach if they experience them firsthand as learners through inservice or pre-service workshops (e.g., Akerson et al., 2007).
- Teachers may not monitor activities effectively, so are not able to give the individual encouragement and guidance (scaffolding) that is frequently needed by learners.

It can be concluded that discovery learning can be a valuable approach for achieving certain learning outcomes concerned with process rather than product. Even Bruner (1966) recognised that firsthand discovery is not appropriate or necessary for bringing about all types of learning.

LINKS TO MORE ON DISCOVERY LEARNING AND INQUIRY

- http://www.learnnc.org/lp/pages/664
- http://www.learnnc.org/lp/tags.php?tag=discovery%20learning
- http://aied.inf.ed.ac.uk/members99/archive/vol_10/joolingen/full.html
- http://en.wikipedia.org/wiki/Discovery_learning

Problem-based learning

Problem-based learning (PBL) is sometimes referred to more accurately as 'issues-based' learning, because many of the topics used for study are not really 'problems'. The method has gained popularity in recent years as highly suitable for use in higher education contexts; but PBL can also be used in upper primary, middle, and secondary schools if the issues to be explored are selected carefully, ensuring that they are age-appropriate and relevant. King (2001, p. 3) states:

> PBL offers a mode of learning which might be considered closer to real life. This real-life link is twofold: firstly, the projects or problems used often reflect or are based on real-life scenarios; secondly, the processes of team-working, research, data collection, critical thinking and so on are those which will be of use to the students in their further careers.

Similarly, Lee (2001, p. 10) has suggested that, 'Learning through problem-solving may be much more effective than traditional didactic methods of learning in creating in the student's mind a body of knowledge that is useful in the future'.

In PBL, students are presented with a real-life issue that requires a decision, or with a real-life problem that requires a solution. With older learners, the problem or issue is often intentionally left ill defined and 'messy' so that there is no clear path or procedure to follow. Students typically work in small collaborative groups. The teacher or tutor has the role of general facilitator of the group discussion, but does not direct or control the investigative process.

Advantages of PBL

- encourages self-direction in learning
- prepares students to think critically and analytically
- empowers students to identify, locate and use appropriate resources
- issues studied are linked closely with the real world and are motivating for students
- active involvement in integrating information and skills from different disciplines
- knowledge and strategies acquired are likely to be retained and transferred to other learning situations

- enhances communication skills and social skills necessary for cooperation and teamwork.

Disadvantages of PBL

- Some students have difficulty sifting irrelevant information from what is relevant for addressing the problem or issue.
- Some students lack flexibility in their thinking and therefore approach an issue from a very narrow perspective.
- Younger students often decide on a solution too early in the process and then resist change later.
- Some problems and issues are very complex. They may call upon knowledge and experience that the students do not possess. Complex problems also greatly increase the cognitive load associated with the task.
- Teachers have difficulty adopting a facilitative, rather than a directing and instructing role.
- Groups don't always work effectively. Even at tertiary education level, students are often not capable at first of executing the tasks associated with PBL independently; they require direction and support throughout the process.
- Some issues or problems may require access to information and resources that the school does not possess.

LINKS TO MORE ON PROBLEM-BASED LEARNING

- An article from the *National Teaching and Learning Forum* available online at: http://www.ntlf.com/html/pi/9812/pbl_1.htm
- See also *Study Guides and Strategies* website at: http://www.studygs.net/pbl.htm
- A useful text: Torp, L., & Sage, S. (2002). *Problems as possibilities: Problem-based learning for K–16 education* (2nd ed.). Alexandria, VA: Association of Supervision and Curriculum Development.
- David Mills has a critique of PBL on The Higher Education Academy website at: http://www.c-sap.bham.ac.uk/resources/project_reports/ShowOverview.asp?id=4

Project-based learning

Project-based learning in various forms and at various levels of sophistication, has been popular for very many years and represents another approach to student-centred learning based on constructivist principles. The simplest form is the well known 'project method' used in primary and secondary schools when students work individually or collaboratively to gather and present information on a chosen topic (e.g., transport; the Second World War; butterflies; China, etc.). But projects are now becoming more ambitious and focused on real-life issues and problems that can be investigated. Indeed, there is a tendency for education writers to use the terms project-based and problem-based almost interchangeably.

According to Thomas (2000, p. 1), 'Project-based learning [utilises] … complex tasks, based on challenging questions or problems that involve students in design, problem-solving, decision making, or investigative activities, give students the opportunity to work relatively autonomously over extended periods of time, and culminate in realistic products or presentations'. The key features are that the content or focus of the study is authentic; the students are encouraged to think and reason independently, the work may involve cooperation and collaboration with others and may or may not involve the use of ICT. One of the advantages of integrating information technology into project work is that students can learn both ICT skills and specific content knowledge simultaneously (OTEC, 2005).

Thomas (2000) suggests that learning that arises from project work tends to be retained more readily than learning acquired as a result of didactic teaching methods. Such learning is also seen as being more flexible and adaptable to new situations. Thomas, who includes problem-based methods in his review of project-based learning, also states that the method is '… equivalent to, or slightly better than, other models of instruction for producing gains in general academic achievement and for developing lower-order cognitive skills in traditional subject matter areas' (p. 34).

Advantages of project-based learning

- The project approach can be applied in almost all areas of the curriculum.
- Projects have a 'real world' orientation and promote meaningful learning by connecting new information to students' past experiences and prior knowledge.

- Students learn valuable processes and skills for gathering and analysing data.
- Students are responsible for their own learning, thus increasing self-direction and motivation.
- The learning process encourages various modes of communication and representation.
- The approach encourages use of higher-order thinking as well as acquisition of facts.
- The approach develops deeper knowledge of subject matter.
- The approach also increases team-working and cooperative learning skills.

Difficulties with project-based learning

- Some students lack adequate skills for researching and collating information.
- Some students may give the impression of productive involvement in the work, but may in fact be learning and contributing very little.
- Where projects involve the production of posters, models, charts, recordings, photographs and written reports on display, there is a danger that these are actually 'window dressing' that hides a fairly shallow investigation and a weak understanding of the topic.
- When different aspects of a topic are given to different group members to research, there is a danger that individual members never really gain an overall understanding of the whole topic.

LINK TO MORE ON PROJECT-BASED LEARNING

- Thomas, J. W. (2000). *A review of research on project-based learning.* San Rafael, CA: Autodesk Foundation. Available online at: http://www.bie.org/files/researchreviewPBL_1.pdf
- Reports on the effectiveness of project-based learning available through Edutopia website at: http://www.edutopia.org/project-based-learning-research
- Buck Institute for Education website provides a number of links and a general overview at: http://pbl-online.org/

Resource-based learning

Although there are many different definitions of resource-based learning (RBL), the approach is usually described as a methodology that allows students to learn from their own active processing of information using a range of authentic resources. Students learn effective skills for using library catalogues, making electronic searches, using CD-ROMs, making telephone calls to seek information, conducting interviews, sending and receiving emails, and writing letters. These skills are valuable for autonomous learning. Some of the skills may need to be taught initially by more direct forms of instruction.

RBL is suited to most areas of the school curriculum. One of its primary goals is to foster students' autonomy in learning by providing opportunities for them to work individually or collaboratively while using appropriate resources and applying relevant literacy, numeracy and study skills to explore interesting topics.

In many ways, resource-based learning shares many characteristics with project-based learning. In both methods the students use books, community publications, reports, videos, DVDs, online material and human resources to obtain information relating to a chosen or set topic that they must collate, analyse, critique and consolidate into an appropriate form for presentation.

Advantages of resource-based learning

- Most students find the method motivating because it involves active participation, hands-on materials, and opportunities to make personal choices.
- The approach is believed to deepen understanding of subject matter.
- It encourages self-directed learning.
- Independent use of research skills is facilitated and strengthened.
- ICT competence and confidence are increased.
- The study skills acquired will be transferable to other areas of the curriculum.
- Time on task is increased, compared to traditional teaching methods.
- Students' attitude toward reading for information improves, and they appreciate the value of a library, computer and resource room.
- While students are using resources, the teacher is able to circulate during the lesson to help or support individual students as required.

- Resource-based activities can be used for follow-up and application after students have been motivated and introduced to a new topic by more direct instructional means.

Difficulties associated with resource-based learning

- Resource-based learning generally requires a resource-rich learning environment, including easy access to computers.
- Effective engagement in researching a topic depends on students having adequate literacy, numeracy and independent study skills.
- Some students will learn little from this method if they lack the prerequisite knowledge for interpreting the new information they obtain.
- Not all teachers are good at collecting or creating the necessary resources, sometimes resulting in poor quality outcomes.
- Teachers may not monitor activities effectively, so are not able to give encouragement and support that is frequently needed by learners.

Computer-assisted learning

In several places above, mention has already been made of the contribution that computers and information technology can make within a constructivist approach; for example, when students are independently searching for information to complete a project or to solve a problem. Computers in the classroom have provided learners and their teachers with fast and easy ways of accessing information, communicating electronically with others, and producing high quality written work and graphics. Computers can also deliver instructional programs covering virtually any area of the curriculum and geared to any age or ability level. Computer software for educational purposes includes not only 'drill and practice' programs (used mainly in tutorial or remedial contexts for building students' skills in areas such as phonics, reading, arithmetic, or spelling) but also interactive instructional programs presenting factual information, simulations and role-play, problem-solving activities, video clips, and of course computer games. Computers and their associated software present great opportunities for motivating students, encouraging independent learning, and for improving the quality of educational programs. The use of ICT continues to grow

rapidly in schools, with increasing numbers of students also having access to a personal computer at home.

Findings from research into the effectiveness of CAL have generally been positive (e.g., Linden et al., 2003; McInerney & McInerney, 2005). Some studies suggest, however, that learning via a computer does not necessarily produce significantly higher achievement in students than can be produced with good quality teaching by more conventional methods. For example, a study involving more than 9000 students from the 1st, 4th and 6th grades in US schools found no significant advantage in using computer software for reading and mathematics (NCEE, 2007). As Ormrod (2000, p. 553) wisely comments:

> A computer can help our students achieve at higher levels only when it provides instruction that we cannot offer as easily or effectively by other means. There is little to be gained when a student is merely reading information on a computer screen instead of reading it in a textbook.

Advantages of CAL

- Teaching of science, social studies, mathematics, environmental education, health and the arts can be enhanced by documentaries or simulation programs and by giving access to Internet resources.
- Programs can stimulate inductive learning through presenting complex and interactive problems.
- With instructional programs, students make active responses and they are 'in charge' of the learning situation.
- Working at a computer is motivating, challenging, but non-threatening.
- Students are helped to move toward greater independence in learning.
- Immediate corrective feedback is provided in most tutorial-type programs.
- Learning can be achieved at an appropriate pace for the student.
- Software can be matched to a student's ability level and is therefore one way of individualising learning.
- CAL is a private method of responding, and students can self-correct mistakes.
- Word-processing facilitates the production of high quality, well-presented assignments.

- Most students enjoy working at the computer more than using textbooks and print resources.

Disadvantages associated with CAL

- Some teachers lack confidence or expertise in integrating ICT into the curriculum.
- There may be a shortage of computers in the school, with computers only available in a computer lab at limited times each week.
- Technical failures can occur.
- CAL places additional demands on teachers' planning and preparation time.
- Some published software, supposedly for educational purposes, turns out to be entertaining but low in educational value.
- Students with literacy problems have difficulty comprehending verbal information on the screen.
- A few students do not like to learn by ICT methods and prefer group interactions with peers and the teacher.

LINKS TO MORE ON ICT AND COMPUTER-ASSISTED LEARNING

- For information on models of cooperative and collaborative uses of ICT (e.g., *Computer Supported Intentional Learning Environments [CSILE];* Computer supported collaborative learning [CSCL] see: http://carbon.cudenver.edu/~mryder/itc/idmodels.html
- For information on *One Laptop per Child Project* see: http://www.laptop.org/vision/index.shtml

four

Teaching methods: Suitability for students

KEY ISSUES

- **The approach to early childhood education:** Should we be supporting developmentally appropriate practice, or early instruction?
- **Adapting teaching to learners' characteristics:** Meeting the learning needs of gifted students, students with learning difficulties, and students with physical, sensory or intellectual disabilities.
- **Teaching methods in special schools:** What is 'special' about special education?

In the previous two chapters attention was given to the suitability of certain teaching methods for presenting certain types of subject matter and for achieving certain objectives with students. This chapter considers how the characteristics of students must also influence our choice of method. Kizlik (2005, p. 2) points out:

> There is no shortage of information on what constitutes a particular instructional method. What is far more important is the professional knowledge base that provides criteria for when a particular method is appropriate for given content *with students at a defined level of development and who have acquired the prerequisites necessary to learn the content*. [emphasis added]

Young learners

Much has been written about teaching approaches that are most appropriate for children in preschools, kindergartens and reception classes of junior primary (infant) schools. The best source of information is the position statement and guideline developed by the National Association for the Education of Young Children (1997), available online. The term 'developmentally appropriate practice' (DAP) has now made its way into the professional literature and policy documents (Bredekamp & Copple, 1997).

The constructivist principles underpinning DAP are that the activities and methods we use with young children should take full account of their relative immaturity, their need for a safe and secure learning environment, their desire for activity and hands-on experience, the value of play and exploration, and the importance of social interaction and talk (Blaustein, 2005). Children are encouraged to learn at their own rate and in their own way rather than being forced along by the pace of the curriculum. Early childhood practices respect and address individual differences among children, their readiness for different types of learning, their cultural backgrounds, their personalities and their learning preferences. In other words, teaching methods and curriculum content should be age appropriate, socially and culturally appropriate and individually appropriate.

Most of these principles can be traced back to pioneers in early childhood education (e.g., Froebel, 1782–1852; Montessori, 1870–1952; Pestalozzi, 1746–1827) and are entirely compatible with constructivist views of teaching. The humanistic tones of DAP philosophy appeal to most preschool and junior-primary teachers, and several research studies have supported the value of establishing classrooms along these lines (e.g., Dunn & Kontos, 1997; Santrock, 2006).

DAP has, however, come in for criticism from some quarters. Some critics believe that ardent advocates of DAP are against using any formal instruction with young children. The critics argue that this view is inappropriate because young children are capable of learning much more than we once believed possible – a view shared by the *neo-Piagetians* (e.g., Case, 1996). They believe that young children are actually capable of far more advanced learning than Piaget's original theories suggest and actually benefit from teaching methods that make demands on them.

LINKS TO MORE ON DEVELOPMENTALLY APPROPRIATE PRACTICE

A large amount of information on DAP, including criticisms, can be found online at:

- http://users.stargate.net/~cokids/dap.html
- http://www.tr.wou.edu/train/cdcDAP.htm
- http://www.ccids.umaine.edu/ec/growingideas/dapsm.pdf

Gifted students

According to Silverman (2007, n.p.), 'Children in the top and bottom three percent of the population have atypical development patterns and require differentiated instruction'. Children in the bottom 3 per cent are those with severe disabilities. Their needs will be discussed later under the section on special schools. The top 3 per cent are those students with very high IQ (above 130) and who often possess special abilities or talents.

Debate has continued for many years on the best teaching methods to use with children of high ability in order to ensure that they develop their full potential and at the same time remain happy and socially well adjusted. Provision ranges from special schools and special classes for gifted and talented students through to placement in regular classes with modifications made to curriculum and instruction (Kondor, 2007). After-hours clubs and tutorial groups are sometimes used to encourage gifted students to pursue subjects of great interest to them. Even special thematic summer camps (e.g., introducing fieldwork in astronomy, geology, local history, etc.) are sometimes organised for gifted students to give them new experiences and fresh challenges.

The vast majority of gifted children remain in regular classes, so the onus is on all classroom teachers to meet their needs. The obvious problem is that if the student of high ability is not suitably challenged by, and interested in, the subject matter being taught he or she will become bored and will lose motivation. The fact that gifted children often tend to be far ahead of their peers in their understanding and their rate of learning presents a major challenge for any teacher.

Inquiry and problem-based learning methods are highly suitable for gifted students, although some students may first need direct teaching of the researching skills that are required for independent learning under these methods. With problem-based methods, in addition to the usual step-by-step and brainstorming approaches to investigation, *synectics* offers an additional way to encourage their creative thinking. Synectics is a process in which divergent ideas are brought together and, where possible, connections are established. In operation, it involves students thinking of unconventional solutions to a given problem. For example: 'How could we get bees to produce honey directly in a jar instead of in a honeycomb in the hive?' Students are encouraged to think in terms of analogies; for example, 'It's like when an animal is tricked into a trap by putting bait inside. The bees could be tricked into the jar'. Students use information they already possess, transform it, and test it against a new situation. Regardless of the actual strategies used to solve problems, the problem-based inquiry approach has much to offer in the education of students of high ability.

The principal ways in which teaching and learning have been differentiated for gifted students in the ordinary classroom include the following:

- *Individualising the student's program:* For at least part of the day, the student is set independent learning assignments or 'learning contracts' that he or she can tackle either alone or with a suitable partner. Children of high ability often express a preference for working independently and planning their own deadlines. The assignment or project should call for the application of study skills, reflection and critical thinking. In an ideal situation some of this study would be conducted using ICT (computer software and the Internet). It has even been suggested that distance education courses that depend on private study are valuable for this purpose, particularly in secondary schools. The student might work on this project while other students are engaged in more routine practice and revision activities. Gifted students generally require less practice and revision.
- *Compacting the curriculum:* This is achieved by assessing what students already know about a new topic before it is taught. Based on what the gifted student knows already, sections of the teaching unit can be deleted (usually by removing a number of activities, readings, resources and teacher-directed mini lectures). The gifted student completes only the work covering

information, concepts and skills that are new to him or her. This frees up class time for the student to engage in more independent study, as above. Rogers (1999) reports that curriculum compacting for gifted students can be very effective.

- *Subject acceleration:* This is similar in some respects to curriculum compacting. Students of high ability are taken more rapidly through a topic by using set readings, computer software, study notes, resource materials and carefully designed homework. The student works fairly independently on the topic. Cross-age tutoring can also be integrated with this model, enabling the gifted student to work at times with an older student who already has expertise in the subject.
- *Ability grouping:* For certain lessons (e.g., mathematics) students, based on their ability, work in smaller groups within the class. The work set for different groups varies in complexity and the class teacher supervises all groups, giving guidance when necessary. A more effective grouping is said to be 'cluster grouping', in which five or six students of high ability are taken together by a teacher who has a special interest in working with them (Rogers, 1999).
- *Mentoring and tutoring:* This involves the student having one-to-one learning time with an adult or older student with specialist knowledge and enthusiasm. When operated well, this method has been found to be a highly effective way of meeting a gifted student's needs (Westberg & Archambault, 1997).
- *Withdrawal sessions:* The gifted student is taken from class at certain times in the week to join with others of similar ability. This method works best when the content of the session is deliberately planned to extend and enrich a subject already being taught in the student's own class. Science, mathematics and creative writing are three areas where this model has much to offer.
- *Grade skipping:* This American term is used when a gifted student is moved to a higher class (usually an older age group in the school) for all or some lessons. There have even been examples in several countries of gifted secondary students being allowed to enrol in university courses ahead of their normal entry date. While this strategy can certainly offer cognitive challenges to the student, concern is sometimes raised about the impact on the student's social and emotional development of being removed from his or her age group.

Regular class teachers can use the following inclusive strategies when presenting lessons:

- Set high expectations for gifted students. Don't encourage under-achievement.
- Use differentiated questioning that involves an adequate amount of higher-level thinking.
- Allow gifted students to discuss and demonstrate to others their ways of tackling various tasks.
- Plan deskwork assignments that contain a good mix of activities at various levels of complexity. Allow choice.
- Always have some interesting supplementary activities related to the lesson objectives available for students who finish their work quickly. Not just 'busy work'.
- Make good use of the special interests of gifted students; share these and value them in the class.
- Organise peer tutoring so that gifted students can work with and assist others.
- Use flexible grouping so that students of differing abilities can work together sometimes.

LINKS TO TEACHING GIFTED STUDENTS

- Rogers, K. B. (1999). Research synthesis regarding gifted education provision. Available online at: http://nswagtc.org.au/info/articles/RogersResearchSynthesis.html
- Rakow, S. (2007). *All means ALL: Classrooms that work for advanced learners.* ERIC document (ED497569). Available online at: http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/2d/77/f7.pdf
- McGrail, L. (2005). *Modifying regular classroom curriculum for gifted and talented students.* Available online at: http://www.prufrock.com/client/client_pages/Modfying_Curriculum.cfm

Students with learning difficulties

Students may have learning difficulties for a variety of reasons, some intrinsic to the child (e.g., below-average mental ability; attention deficits;

hearing or vision problems; learning disability), but others are due to outside influences including inappropriate school curriculum or methods of teaching (Westwood, 2008a). While teachers have very limited control over most of the intrinsic influences on learning, they do have control over what is taught and the manner in which it is taught. In the same way that it is necessary to adapt the curriculum, methods and classroom organisation to meet the needs of gifted and talented students, it is also necessary to make some modifications for students with difficulties. It is generally not necessary to seek totally different or 'special' methods for these students because the answer mainly lies in using existing instructional approaches with greater intensity and precision. Ellis (2005, p. 3) remarks that '… teaching practices for those with learning difficulties need to be considered in the context of the 'generally effective pedagogy'.

Several writers have surveyed the research evidence to discover which methods work most effectively for students with learning problems (e.g., Carnine, Dixon & Silbert, 1998; Forness, Kavale, Blum & Lloyd, 1997; Swanson, 2000). The consensus of opinion indicates that these students learn best, particularly in academic subjects, when the teaching approach, in the beginning stages, is carefully structured and provides abundant opportunities for successful practice and application. Direct instructional methods, together with training in cognitive strategy use, have consistently proved to be the most effect approach. Swanson (2000, p. 23) concludes:

> A combined direct instruction and strategy instruction model is an effective procedure for remediating learning disabilities when compared to other instructional models. The important instructional components that primarily make up this model are: attention to sequence, drill-repetition-practice, segmenting information into parts, controlling of task difficulty through prompts and cues, making use of technology, the teacher systematically modeling problem-solving steps, and making use of small interactive groups.

Some years earlier Lloyd (1988) had reached very similar conclusions. Lloyd tells us research indicates that the most effective approaches for reducing student failure rates have tended to be:

- *structured:* characterised by a great deal of teacher direction in the initial stages of learning

- *goal oriented:* the students are clear about what is to be achieved
- *with an emphasis on practice:* new information and skills are repeated and applied many times to ensure acquisition and maintenance
- *with an emphasis on strategy training:* students are taught *how* to attempt the tasks set for them
- *independence oriented:* although highly teacher-directed in the early stages, learners are expected to acquire knowledge and skills that will enable them later to work independently.

When looking at specific areas of the curriculum, several writers have advanced the proposition that current methods of teaching are not meeting the needs of some students, and that students with learning difficulties are put at risk. For example, in many countries, the teaching of reading over the past two decades has mainly been via the constructivist whole language approach. This method does not favour the direct teaching of phonics and word building, two essential component skills in both reading and spelling. As a consequence, many students with learning difficulties do not pick up the skills by incidental learning and remain struggling readers with difficulties across the curriculum (e.g., Coltheart & Prior, 2006; Swan & Lyon, 2005). They make much better progress when taught by direct methods that explicitly teach decoding and comprehension strategies. Similarly, in the domain of arithmetic, some experts are questioning whether problem-based approaches have gone too far, to the extent that through lack of practice, children with learning difficulties are unable to carry out routine calculations with speed and accuracy (e.g., Farkota, 2005; Kroesbergen et al., 2004). Even in areas like science, where investigative approaches are most strongly advocated, there are opinions emerging that some students need more explicit teaching, rather than 'discovery', if they are to develop the necessary concepts (e.g., Klahr & Li, 2005; McCleery & Tindal, 1999; Whitman & Evans, 2006).

The current position is that in most of the basic academic subjects the preferred model is a balanced program comprising direct teaching of essential skills combined with the more functional, motivating and creative elements of whole language and whole maths. Ellis (2005, p. 46) concludes: 'Best practice is now recognised by classroom practitioners as the applying of a combination of instructional approaches which best fit the students being taught'. Best practice also suggests that accommodations and modi-

fications to curriculum content (differentiation) are needed to address the range of ability found in today's classrooms (e.g., Fahsl, 2007; Tomlinson, 1996, 2003). Strategies for differentiation are discussed in chapter 5.

Students with disabilities

Does teaching in a special school call for totally different teaching methods? What is 'special' about special education? The answers to these two questions depend on several variables; for example, the type of disability a student has, the severity of that disability, and its impact on learning capacity. In some cases the teaching methods may be identical to those used in mainstream schools, but in other cases modifications and additions are required.

Students with physical disability

Students with physical disabilities comprise a relatively small but diverse group. Their disabilities range from those that have little or no influence on learning and development, through to other conditions that may involve neurological impairment affecting perception, cognition and movement. The ability range of children with physical impairments is comparable to that within the normal school population, so students of lower ability require direct teaching and adaptations described in the previous section, the students of average ability require no major modifications, and the gifted or high-ability students benefit from the acceleration and enrichment methods described earlier.

It is important for teachers to realise that a physical disability does not automatically impair a student's ability to learn. In the case of students with physical disabilities (in the absence of other handicapping conditions), the teaching methods used are often the same as those applied in an ordinary school. What all students with physical disability need most is improved access to the learning environment. It is usually necessary for the teacher to undertake a *situation analysis* relating to the learning environment. It is essential to consider any modifications needed to seating, equipment, access routes, use of available technical supports and resources, in order to enhance the students' opportunities to participate.

Assistive technology ranges from 'low tech' equipment such as slant-top desks, pencil grips, modified scissor grips, specially designed seating,

pads and wedges to help position a child for optimum functioning, electric wheelchairs, walking and standing frames, and head-pointers, through to high-tech adaptations such as computer switching devices operated by a blink of the eyes. None of these aids impact directly on teaching method, but a teacher needs to be fully aware of the purpose and function of all the assistive technology and positioning aids used by a student in order to help make that student comfortable and able to benefit from every lesson. Some students may also require alternative or supported methods of communication (e.g., a modified keyboard; touch-screen computer; communication board; voice synthesiser, etc.) and instructional resources may need to be specially designed to accommodate a student's limited range of movement (Best et al., 2005). Students with physical disabilities may also require various forms of therapy (physiotherapy, speech therapy, hydro-therapy), but discussion of these is beyond the scope of this book.

One of the few 'special' methods used in some special schools for students with physical disabilities is *conductive education*. In this approach, children with cerebral palsy are taken through an intensive daily program using a range of physical supports to help them gain greater control over their movements. Their teacher (the 'conductor') is responsible for integrating various forms of therapy into the program instead of the student being taken from the class to attend therapy sessions elsewhere. Research on conductive education has yielded mixed results, casting some doubt on its overall efficacy; but the method remains popular (Darrah et al., 2004).

Students with impaired vision

In the population of children with impaired vision there are those who are totally blind, those who are 'legally' blind, and those with varying degrees of partial sight. As with physical disability, impaired vision does not automatically mean that a student has lower intelligence; but it does mean that modified ways of accessing the curriculum will be needed. It is essential for teachers not to hold low expectations of students with impaired vision, but to provide many new challenges and encourage them to do as much as possible (Lieberman & Wilson, 2005).

Many devices have been designed to enable a student with impaired vision to cope with the medium of print. The devices include magnification aids, closed-circuit television and microfiche readers (used to enlarge an

image), talking calculators, speaking clocks, dictionaries with speech outputs, 'compressed speech' recordings, and thermoform duplicators used to reproduce Braille pages or embossed pictures, diagrams and maps. *Low vision aids* are magnification devices or instruments that help the individual with some sight to work with maximum visual efficiency. Some students with impaired vision benefit from modified furniture such as desks with bookstands or angled tops to bring materials closer to the child's eyes without the need to lean over, or with lamp attachments for increased illumination of the page.

Students with impaired vision also require specific training in *mobility* (moving safely about the environment) and *orientation* (being familiar with various environments to the extent that you know your position relative to other objects). Blind students, if they have sufficient ability, are taught Braille, an alternative written communication system using fingertip touch to 'read' patterns of raised dots on the page. Orientation, mobility and Braille are usually taught by specialist teachers or trainers.

For general teaching purposes the following suggestions can be integrated into the teaching method the class teacher is using with partially sighted students:

- Encourage partially sighted students to use their residual vision effectively. Using the remaining vision is helpful, not harmful to these students.
- Use a word processor or photocopier to greatly enlarge all text and notes.
- Allow students when writing to use a fibre-tip black pen that will produce clear, bold writing.
- Allow much more time for students with impaired vision to complete their work.
- Read written instructions to students to reduce the amount of time required to begin a task and to ensure that the work is understood.
- Use very clear descriptions and explanations; verbal explanation has to compensate for what the student cannot easily see.
- Train other students, and any classroom aide or assistant you may have, to support the student with impaired vision (e.g., for note-taking, repeating explanations).
- Speak to blind students frequently by name during lessons to engage them fully in the group learning processes. Make sure they contribute. Value their contributions in the same way that you value those of other students.

- Make sure that any assistive equipment is always at hand and in good order.
- Ensure that your material on the board or screen is neat and clear, using larger script than usual. Keep the board surfaces clean.
- Avoid overloading worksheets with too much information and heavy density of print.

Students with impaired hearing

Students with impaired hearing have differing degrees of hearing loss, ranging from mild loss to profound deafness. Most students with mild to moderate losses usually attend mainstream schools; it is only students with significant deafness or with additional handicaps who are in special settings.

The degree of hearing loss influences the degree of difficulty the student will have in learning from auditory methods of teaching. Obviously, a problem with hearing presents a barrier to learning by listening. Hearing loss places a young child at risk of delay in many areas, including the acquisition of spoken language and literacy skills. A priority goal in the education of all students with impaired hearing is to advance their language and literacy skills as much as possible. Any improvement in language will allow a student to make better use of his or her intellectual potential, understand much more of the curriculum, and develop socially.

Helping a deaf student acquire intelligible speech is one of the major roles for teachers working in special schools or units; and it is usually a long and difficult process. Speech therapists or language teachers may use speech and articulation coaching, based mainly on behavioural principles of modelling, imitation, reinforcement and shaping. In recent years, however, therapists have placed equal importance on trying to stimulate language development through the use of naturally occurring activities in the classroom ('milieu teaching', e.g., Kaiser & Grim, 2006). Such teaching is thought to result in better transfer and generalisation of vocabulary and language patterns to the child's everyday life.

Careful attention must be given to explicit teaching of reading and spelling skills to students with impaired hearing. It is typical of these students that as they progress through primary school they fall three to four years behind their peers in terms of reading ability. This lag has a very detrimental impact on their ability to learn in all subjects across the

curriculum. The written expression of deaf children is often reported also to be problematic (Antia et al., 2005) with syntax and vocabulary the major weaknesses. Their difficulties often include inaccurate sentence structure, incorrect verb tenses, difficulties representing plurals correctly and inconsistencies in using correct pronouns. The written work of older deaf students has many of the characteristics of the writing of younger children, and may also contain 'deafisms' involving incorrect word order (e.g., 'He got soccer ball new', instead of 'He has a new soccer ball').

Special schools and centres for deaf students tend to base their teaching approach on one of three alternative communication methods. Some schools favour the *oral-aural approach* which encourages the use of a student's remaining hearing (maximised by wearing a hearing aid), lip reading and speech. This is the preferred method because it gives the deaf student the best opportunity to be accepted in the wider community. Other schools or centres prefer a *manual approach* that makes significant use of sign language and finger spelling to supplement speaking. The problem is that students who rely on sign language do not find many individuals in the outside community who can sign, so manual communication is a barrier to social integration. The third option, now popular in many centres, is *total communication* (TC) that makes use of a combination of signing, gesture and oral-aural modes of communication.

Just as students with physical disability or vision impairment are supported by assistive technology, so too technology is important for hearing-impaired students. The most obvious example is the 'behind the ear' or 'in the ear' hearing aid. No hearing aid fully compensates for hearing loss, even when carefully tailored to the user's hearing characteristics. The great limitation of the conventional type of hearing aid is that it amplifies all sound, including noise in the classroom. The advantage of the more recent radio frequency (FM) aid is that it allows the teacher's voice to be received with minimum interference from environmental noise. The teacher wears a small microphone and the child's hearing aid receives the sounds in the same way that a radio receives a broadcast transmission. The child can be anywhere in the classroom and does not need to be close to or facing the teacher.

The following basic strategies can be integrated into any teaching method to help hearing impaired students:

- Make greater use of visual methods of presenting information whenever possible.
- Use clear and simple language when explaining new concepts. Teach new vocabulary thoroughly. Write new vocabulary on the board. Ensure the student hears the word, sees the word, and says the word.
- Give instructions clearly. Repeat instructions while facing the student. Don't give instructions while there is noise in the classroom. Where possible, write instructions as short statements on the board.
- Always call on the student by name when you are about to ask a question or give out information.
- Check frequently that the student is on task and has understood what he or she is required to do.
- Where possible, provide the student with printed notes to ensure that key lesson content is summarised. It may not have been heard during the lesson.
- Do not talk while facing the board; the deaf student needs to see your mouth and facial expression.
- Try to reduce background noise when listening activities are conducted.
- Seat the student where he or she can see you easily, can see the board, and can observe the other students.

Students with intellectual disability

In some countries the term 'mental retardation' or 'mental handicap' is still used to describe this disability. Students with intellectual disability are those with an IQ below 70 (in some cases far below 70) and who display limitations in self-control and independent functioning. Most children with mild intellectual disability are now integrated in mainstream schools, but those with moderate to severe disability still attend special schools.

When special schools and centres for these children were first established (often toward the end of the 1800s in many countries) the emphasis was very much on 'care' and 'management' rather than education. In the more enlightened settings methods were used to provide sensory stimulation for young children in the hope that this would encourage cognitive and perceptual development. For those who could benefit, some very basic training in daily living skills was provided, and some attempt was made to prepare older students for later sheltered workshop employment. Even in the first half of the 1900s some children with intellectual disability were still classified as 'ineducable' and were placed in institutions with no

educational program at all. Indeed, in some countries (including the United Kingdom) it was not until the 1970s that *all* children with disabilities were entitled to an education.

During the period 1900 to 1950, emphasis in special schools and training centres remained mainly on care and management. Some of the children were deemed to be 'trainable' and others 'educable' (terms popular in the United States of America). Any teaching that was attempted usually related to teaching everyday living skills, plus some craft work. Training focused on self-help skills such as routine tasks of preparing a simple meal, washing clothes, cleaning a kitchen, and so forth, taught by direct methods using demonstration, imitation, and much repetition. In addition, for educable children the curriculum began to include a very watered-down and simplified version of a normal primary school program, with some reading and number work.

The period from 1950 to the end of the 1960s in special schools has been described as the era of the *Developmental Approach*. The guiding principle, influenced greatly by contemporary practice in preschools, was to match teaching methods to a child's maturational and interest level, not to age. Activity methods were encouraged because it was recognised that children 'learn by doing' and that children make progress at individual rates and in their own ways. In particular, it was recommended not to try to force children to learn things they may not be ready to learn. Children's play activities were encouraged as a natural way of gaining cognitive skills, communication and social skills.

The 1970s heralded the dawn of the *Behavioural Approach* in which teachers were required to engage in careful lesson planning by identifying students' needs, setting relevant targets, translating the targets into a set of behavioural objectives, conducting task analysis to identify steps in learning, and then applying behavioural teaching methods (modelling, direct teaching, imitation, practice, reinforcement and shaping). The behavioural approach introduced greater structure into special school teaching and raised expectations for what could be achieved. The approach continues to be widely used in special schools everywhere because it is reasonably effective.

Alongside the behavioural approach (and co-existing with it) came the *Life Skills* or *Functional Approach*. This was really a re-emphasising of what was considered important for students' greater independence and

for coping with everyday life. 'Functional academics' began appearing on many timetables, and covered basic reading, writing and number skills, also geared to everyday life.

In several countries (including the UK and Australia) the 1990s witnessed a move toward 'making special schools ordinary' by encouraging them to follow a broader curriculum, as much like mainstream curriculum as possible (Westwood, 2001a). It was suggested that special schools should adopt the mainstream national curriculum framework of subjects and assessment procedures. It was argued that children with intellectual disability have the same rights as all other children to follow a normal program of instruction. Many special schools have welcomed such a change, but some remain unconvinced, arguing that the whole purpose of having a special school is so that the curriculum can be different and teaching methods can be adapted to the children's functional level. This view has become even more relevant because, compared with a few years ago, the population of students in special schools now comprises more students with severe and multiple handicaps. The relatively more capable students with intellectual disability have been moved to ordinary school placements under policies of inclusion.

In the post-2000 period there has been a great increase in use of ICT in special schools, particularly in the form of computer-assisted learning. Assistive technology for enhancing communication is also rapidly increasing.

Current practices in special schools for intellectually disabled students still tend to include elements of all of the above methods and philosophies. The following recent approaches have also been added:

- *Snoezelen approach:* This approach was first developed in the Netherlands and represents a return to sensory stimulation for severely handicapped children and for autistic children. A room is specially equipped with a range of colourful materials, lights, moving objects, sounds, textures and aromas (Cuvo et al., 2001).
- *Intensive Interactive Approach:* This builds on severely handicapped students' existing responses and behaviours in a 'natural' way. The teacher does not direct the child intrusively, but rather joins in with what the child can do already. The approach is said to be similar to the way loving parents and

other adults respond to babies by reacting to their actions (smiling, touching, rocking, etc.) (Caldwell, 2006).

- *TEACCH:* This is a comprehensive approach devised in the United States of America but spreading worldwide for students with autism. The principal aim is to teach them communication skills, attending, responding, and social interaction. The focus includes teaching skills relevant for operating in the local community. Parents are very actively involved in the approach (Mesibov et al., 2005).
- At regular intervals since the 1950s, new methods for dealing with autism, intellectual disability and other forms of learning handicap have appeared. Many of these can only be classed at best as 'fringe therapies'. The claims made for their efficacy are usually unsupported by any hard research evidence (Simpson, 2005). Unfortunately, parents of children with severe disabilities are always searching for something new that may help their child, and they often invest time, energy and money in approaches that simply do not work.

LINKS TO MORE ON SPECIAL SCHOOL METHODS

- An exemplary document outlining the policies and practices in a special school is available online at: http://www.stanley.wirral.sch.uk/admin/files/files/Curriculum%20Overview.pdf
- Qualifications and Curriculum Authority (2001). *Planning, teaching and assessing the curriculum for pupils with learning difficulties.* London: Department for Education and Employment. Available online at: http://www.nc.uk.net/ld/dump/GG_ld.pdf

five

Effective teaching

KEY ISSUES

- **The professional skills and attitudes of effective teachers:** Research has provided clear evidence of the key features of effective classroom teaching.
- **Effective teachers are trained in presentation skills, questioning and feedback:** These features of effective teaching greatly enhance students' learning.
- **Effective teachers demonstrate effective learning strategies for students to use:** Teachers can help students become more efficient learners.
- **Effective teachers respond to differences among students:** At times, teaching methods and curriculum must be adapted to match students' abilities and needs.

Teacher effectiveness is not concerned with any particular teaching *method*. Rather, it is concerned in a more general sense with the way in which teachers operate in their classrooms – the decisions they make, the actions they take, their interactions with students, their presentation skills, and the way they manage the group.

Information on teacher effectiveness is drawn partly from what was termed 'process–product research' in the 1970s and 1980s (e.g., Brophy & Good, 1986; Stallings & Kaskowitz, 1974). This research will be examined in a moment. Other information comes from regular large-scale studies

of student achievement such as TIMSS (*Third International Mathematics and Science Study* conducted four times between 1995 and 2007 (Mullis et al., 2005)) and PIRLS (*Progress in International Reading Literacy Study* (Baer et al., 2007)) conducted in 2001 and 2006. As a key aspect of these studies, teachers' instructional skills and practices have been considered in relation to students' achievement in mathematics, science and reading comprehension.

Process–product research

Process–product research focuses on what teachers actually do that appears to make a difference to how well their students learn. The seminal process–product studies of the 1970s and early 1980s investigated teachers' actions and reactions when conducting typical lessons. These were observed and data recorded in the classroom and later quantified and analysed. The results were then correlated with students' measured achievement (test results) in the subject matter covered in the lessons. In this design, teachers' actions represented the 'process' of instruction while students' test scores represented the 'product' from the teaching. Although these studies yielded valuable information, the statistical treatment involved only *correlation* of the variables so could not be used to prove conclusively a cause-effect relationship between teachers' actions and learning outcomes (Gage, 1985; Kauchak & Eggen, 2007). Later, experimental studies were designed involving teachers who had been trained to use the various strategies or behaviours that correlational studies had suggested were effective. Their students' results were then compared with those of students taught by teachers not trained in the strategies (e.g., Gage & Giaconia, 1981). From such data emerged a better understanding of effective classroom instruction. Yates (2005, p. 683) says of these teacher effectiveness studies:

> Arguably, the process–product work managed by Jane Stallings was amongst the most spectacular, large-scale, well-run, and important pieces of classroom-based research ever conducted. Her work gave rise to the central focus on engagement time and opportunity to learn as key factors underlying skill development within classrooms ... [T]he basic research findings remain as strong statements describing natural relationships between teacher behaviour and student development.

Beyond process–product studies

More recently, research has added to the earlier knowledge base by investigating what 'expert' teachers do that may account for their students' higher than expected achievement (e.g., Waxman & Walberg, 1991). Findings from these studies have highlighted the importance of such elements as the teacher's classroom management style, expectations, instructional scaffolding, content knowledge and presentation skills. Garmston (1998) suggests that expert teachers possess a number of important attributes including a deep knowledge of their subject, a varied repertoire of teaching skills, and an understanding of students and how they learn. Shulman (1987) stressed that in addition to content (subject matter) knowledge effective teachers need to possess 'pedagogical content knowledge'; that is, knowing how best to organise and present particular subject matter in a way that optimises students' learning.

The most recent reviews have focused not only on teaching skills per se but also on the personal and empathic qualities of teachers. For example, the Hay McBer Report (2000) indicates that in addition to excellent teaching skills, the most effective teachers are seen to be professional in their daily work (e.g., responsible, keen, cooperative, business-like, keeping abreast of changes, etc.), and they create a positive classroom climate in which students feel valued, trusted and supported. The authors of that report suggest that these three attributes of effective teachers account for some 30 per cent of the variance in students' academic achievement.

Highly effective teachers seem to have something extra that sets them apart from less effective teachers – that 'something' appears to be a positive rapport with, and genuine respect for, the students they teach (Agne et al., 1994). Effective teaching therefore combines knowledge of pedagogy and knowledge of subject matter together with human relationship skills, judgement, humour and intuition. To be an effective teacher takes much more than technical knowledge about instructional procedures.

Key evidence from research on teacher effectiveness

The research on teaching suggests that effective teachers generally exhibit the characteristics summarised below. But, as Yates (2005) and others have pointed out, lists of this type should not be used in simplistic ways. Yates

comments: 'One is not entitled to walk into a teacher's classroom and match what can be seen readily against an artificial checklist based upon someone's interpretation of teacher effectiveness research' (p. 687). Rather, these features of effective teaching may guide to some extent the focus that should be (but rarely is) given in teacher preparation courses. They may also serve as a stimulus for individual teachers to reflect upon their own practices.

Studies of effective teachers have tended to reveal that they:

- show enthusiasm
- have well-managed classrooms
- provide students with the maximum opportunity to learn;
- maintain an academic focus;
- have high, rather than low, expectations of what students can achieve
- are business-like and work-oriented
- involve all students in the lesson
- use strategies to keep students on task, motivated and productive
- impose structure on the content to be covered
- present new material in a step-by-step manner
- employ direct (explicit) teaching procedures when necessary
- use clear instructions and explanations
- use a variety of teaching styles, methods and resources
- frequently demonstrate appropriate task-approach strategies
- monitor closely what students are doing throughout a lesson
- adjust instruction to individual needs, and re-teach content where necessary
- provide frequent feedback to students
- use high rates of questioning to involve students and to check for understanding
- differentiate their questions according to students' ability
- spend significant amounts of time in interactive whole-class teaching; but also use group work and partner activities when appropriate.

It is surprising that most of these components of effective teaching are not given much prominence in the professional training of teachers at this time (Reynolds, 2000; Yates, 2005). The manner in which constructivist theory is translated into classroom practices taught to beginning teachers by university departments of education seems totally to ignore this body of information.

Criticisms of the effective teaching data

It is sometimes suggested that the effective teaching model as described above is too prescriptive and formal (e.g., Davis, 1999). To some commentators in this era of 'warm, fuzzy' humanistic education, the model seems to deny that teaching is a creative and spontaneous activity. They argue that teaching is a highly personal and idiosyncratic process that is much too complex to permit analysis into component skills. The critics suggest that the effective teacher model wrongly implies that following a formula for working in a classroom will automatically produce good results. Others hold quite different views and suggest that the effective teaching model is so important that it should be taught thoroughly and implemented in all teacher education courses (e.g., Reynolds, 2000). We are a very long way from that situation at the moment.

It is also sometimes alleged that what is described in effective teaching literature is a 'behaviourist' position – the teacher dominates the learning situation, the students respond, are in some way rewarded or reinforced, and learning takes place. The teacher is thus 'de-humanised'. This is a very inaccurate interpretation of the research work on effective classroom teaching, because such teaching involves dynamic interactions between teachers and learners. The teacher is effective because he or she is sensitive to and responsive to, the characteristics and individual differences among the students. Research has indicated that effective teachers are actually warm, concerned and flexible in their general approach to students (Wilen et al., 2008). This empathetic and human quality in good teachers is also reflected in the comments made about teachers by the students themselves (e.g., Batten et al., 1993; Morgan & Morris, 1999).

Pedagogical skills of effective teachers

There are five areas in which skilled teachers display their expertise. These areas include presenting and explaining subject matter and ideas, questioning students during lesson time, giving feedback, strategy training and adapting or differentiating instruction.

Presenting and explaining

Presenting information to children, giving explanations, and answering students' questions are three of the main activities in which teachers engage

(Eggen & Kauchak, 2004). Clarity in teaching is often the main quality that sets highly effective teachers apart from less effective colleagues. Expert teachers who obtain consistently good results from students are reported to incorporate the following features within their lessons (Bush & Kincer, 1993):

- efficient initial presentation of new work
- clear and precise instructions
- a greater variety of ways of explaining topics.

Effective classroom teaching, as with formal lecturing, requires *clarity* in the teacher's presentations. Poor explanations usually get students utterly confused and therefore create learning problems. This lack of clarity may be due to a failure to communicate effectively at the students' language and ability level, using complex terminology, failing to draw analogies or give examples to which students can relate, giving instructions out of sequence, inadequate use of visual support material, presenting too much information at one time, not making relationships clear, and failing to check for understanding.

Sotto (1994) believes that a teacher's clarity when instructing and explaining relies on:

- knowing the subject matter extremely well
- appreciating the subject matter from the perspective of a novice learning it for the first time
- identifying key ideas to emphasise in what is being taught
- explaining things in simple terms.

Explaining need not (and should not) be a one-way process. A good explanation requires questions directed to the students to ensure that what is being said is making sense; and students should be encouraged to ask the teacher questions during and after an explanation. Perhaps the least helpful question for a teacher to ask (but one that is frequently heard) is 'Do you understand that?' Very few students, especially those who lack confidence and those not doing well, are going to confess in front of the entire class that they don't understand.

Teachers striving to reduce learning failure in their classrooms need to attend closely to issues of clarity. One of the most self-revealing activities teachers can engage in is to record on audio-tape an entire lesson,

and later appraise and reflect upon the quality and clarity of their own communications.

Questioning

Questioning students is an essential part of effective instruction, and plays an important role in promoting learning in both teacher-directed and student-centred approaches. Research has indicated that the teachers of classes showing the highest achievement levels are found to ask many questions during their lessons, with very few questions yielding incorrect responses, or no response at all from the students (Brophy & Good, 1986).

Questioning is used to:

- facilitate students' participation and communication during the lesson
- focus attention on key aspects of a topic
- evaluate students' understanding
- stimulate particular types of thinking
- review essential content
- control the group of students and hold attention.

Some questions can be simple and direct (sometimes called lower-order questions) focusing on facts and principles, while others can be higher-order questions that require reflection, critical thinking and reasoning (Ormrod, 2000). Depending on the nature of the subject matter and the age and ability of the students, the balance between lower- and higher-order questions can be adjusted. It has been demonstrated that children with poor learning skills seem to benefit from instruction that includes a high percentage of simple direct questions, focusing on the core content of the lesson. It is as if answering these questions helps firm up a student's grasp of the topic. If students are struggling to assimilate basic facts, then it is usually necessary to ask more questions from the lower-order category.

An important aspect of questioning is 'wait-time'. Teachers often ask between three and five questions a minute during presentations and discussions, but they allow only a second or so for a child to respond before asking someone else, or providing the answer themselves. When teachers deliberately extend wait time to 3 seconds or more when they ask a question, *and* after a student's response, more students will offer an answer,

the length of their responses increase, contributions from students of lower ability increase, and the number of questions asked by students increases (Rowe, 1986).

Some common errors in questioning include:

- asking too many difficult or poorly expressed questions
- continuing to ask questions even though students have indicated lack of knowledge on the topic
- taking answers only from students who volunteer
- failing to provide corrective feedback on incorrect or inappropriate responses.

In an early review of research, Good (1981) suggested that teachers' questioning was one factor that could cause passivity in lower-ability students. This occurs for two reasons: firstly, teachers in regular classes tend to call on lower-ability students less often; secondly they do not wait as long for lower-ability students to answer. They are also less likely to spend time encouraging these students to think more deeply and to elaborate on any answers they do give. Those comments would seem to apply equally in our classrooms today.

Giving feedback

Another essential teaching function is the giving of feedback to students. Constructive comment from a teacher motivates students and informs them of how they are progressing and what they may need to focus on. The most useful feedback comes immediately after a student has made a response or has completed a task. It should come in the form of *descriptive praise* if the student's work is good. Descriptive praise not only says 'well done' but also specifies why the praise is given. For example: 'Well done, Fiona. You measured the amount of flour exactly as the recipe states'. 'That is good work, Mark. I can see that you have already gone back and checked the spelling'. On the other hand, if a student's response is incorrect the teacher should provide immediate correction to help remove the misconception and to supply accurate information.

Written feedback on students' class work and homework assignments also serves a useful purpose if it is descriptive. Brief comments such as 'Satisfactory' or 'You could have included more detail' are not helpful, and are largely ignored by students.

Often, corrective feedback will require that the teacher explain again something that has already been taught. When this is necessary it is useful if the teacher first asks the student to explain or demonstrate what he or she already knows about the topic or process; re-teaching can then focus on the precise point of confusion. For example, in mathematics, if a student is having difficulty dividing 303 by 7, the teacher asks the student to begin working on the problem and to 'think aloud' at each step as the teacher watches. At the precise point of difficulty the teacher can provide the corrective feedback. This is much more effective than re-teaching the whole process from the beginning, because often the student still does not recognise the error.

When feedback is given, it should be delivered in a positive emotional tone, not with annoyance or frustration (Kauchak & Eggen, 2007). Students need to feel safe in asking for assistance.

Strategy training

Perhaps the most important discovery to be made since research moved beyond the simple process–product studies is that it isn't only what the teacher does that is important; students themselves must become more efficient in their approach to learning. Effective instruction must therefore include an element of teaching students how to learn. One of the ways in which all learners can become more successful – and failure rates can be reduced – is to teach students the most effective ways of approaching the various tasks they are required to attempt in the classroom. Time is devoted to thinking about the actual *processes* involved in completing classroom tasks, as well as having regard for the quality of the product. '*How* do we do this?' is as important as 'How did it turn out?' This is of particular importance for students with learning difficulties who often lack effective cognitive strategies.

In strategy training, students are explicitly taught, via clear modelling, demonstration and 'thinking aloud' by the teacher, precisely how to approach a particular task or problem. In the typical classroom these tasks might include, for example, finding the meaning of an unfamiliar word in the textbook, writing a summary of the key points from a video, planning and composing ideas for a piece of writing, solving a mathematics word problem, or researching a topic for a special project. The teacher might

use the overhead projector to demonstrate the writing of a summary – first highlighting key points in the text, numbering the points in a suitable sequence, drafting the first version on the screen, then editing and revising the final version – all the time 'thinking aloud' and making decisions.

Usually the teaching of a strategy includes helping students 'think about their own thinking' in relation to the task at hand. This usually requires them to pose questions in their mind as they work through the task. For example, 'Where do I begin?' 'Is this working out OK?' 'Do I need to check that answer?' 'Do I understand this?' 'Do I need to ask for help here?' This ability to monitor and regulate one's own thinking is called 'metacognition'. Students need to be taught metacognitive skills to increase their rate of self-monitoring and self-correcting at all stages of the process. Frequently, in less effective teaching, we assume that students already have these task-approach and self-monitoring skills, or will develop them incidentally while undertaking the work. This false assumption leads to learning problems.

Adapting and differentiating instruction

The final component of effective teaching to be considered here is responding to differences among students. Adaptive instruction is defined as instruction geared to the characteristics and needs of individual students. The term 'differentiation' is now used in many countries to convey this idea of adapting instruction to match differences in students' abilities (Cusumano & Muller, 2007; Good & Brophy, 2008). The most manageable form of differentiation usually involves teaching the same curriculum topic to all students but tailoring the resources, the learning activities, and the amount of teacher-support to the differing capabilities of individual students. Wherever possible, studying the same topic by different paths and in different ways is regarded as preferable to any ambitious attempt to individualise instruction, set up alternative courses, or stream students by ability.

Classroom observation has revealed that effective teachers already do much to adapt the processes of instruction while lessons are in progress (Chan et al., 2002; Scott et al., 1998). For example, the following tactics are observed during lessons when teachers are sensitive to differences among learners. The teacher:

- varies the method as necessary during the lesson, from teacher-directed to student-centred, according to students' abilities and needs
- simplifies and restates instructions for some students
- sets shorter-term goals for some students
- monitors the work of some students more closely than others
- re-teaches certain students when necessary, or provides an additional demonstration
- accepts different quantities and qualities of bookwork
- provides more (or less) assistance to students as they work
- gives more descriptive praise to certain students
- praises some students more frequently than others
- rewards different students in different ways
- asks questions at different degrees of complexity, according to students' ability
- encourages peer assistance
- selects or creates alternative resource materials.

Rather less frequently, teachers may deliberately plan and prepare differentiated activities and tasks (e.g., 'tiered assignments'; graded worksheets). Even less frequently teachers may set differentiated homework, with extension activities for the more able students and practice or consolidation exercises for the less able. These strategies are used less frequently because they demand considerably more time and effort from a teacher.

Tomlinson (1996), the leading US exponent of differentiated instruction, mainly focuses on adapting curriculum content, student activities and student products. She suggests the following general principles:

- *Adapting curriculum content:* This could mean that students with learning difficulties are required to cover less material in the course, and complex concepts would be simplified or even deleted. In the case of gifted students the reverse would be true; they would do more work and in greater depth, and would do the work more independently (see 'curriculum compacting' in chapter 4).
- *Modifying classroom activities:* The nature of the learning tasks set for different students or groups of students would vary, with some work set at a simple level while other tasks are at a more complex level. Resource materials would also be differentiated.

- *Varying student output:* Allow for variation in the outcomes from the learning process. Sometimes the outcome will be a tangible product such as written work, a diagram, or an object; but sometimes the 'product' refers to other types of output such as an oral report, a performance, a presentation to the group, participation in discussion, or answering of oral questions. Each student is not expected to produce exactly the same amount, type or quality of work as every other student. Individual students might negotiate what they will produce, and how they will produce it.

Other writers suggest that differentiation should also occur in classroom management strategies (such as grouping and peer tutoring), in student–teacher interactions (e.g., more contact or less contact with the teacher), in the arrangement of the classroom environment, and in methods of assessment and grading (Minke & Bear, 2000; Scott et al., 1998).

In the primary and junior-primary years, teachers sometimes establish 'learning centres' in the classroom. These are independent stations established within the room and equipped with necessary resources. They may be nothing more elaborate than a spare table set up in the corner, with materials and (ideally) a computer. Individual children can be directed to the learning centre where they will find instruction cards, activities and resources geared to different abilities and interests. Centres provide children with opportunities for hands-on learning, investigations, cooperative learning, social interaction and problem solving. In particular, they encourage greater independence and self-regulation in learning. Centres of this kind are particularly suitable for gifted children, but can be used by students of almost any ability level if the activities can be tailored to their needs. They can be used in conjunction with 'individual learning contracts', where children negotiate a personal study program with a teacher. For example, it might be agreed that from 9.30 am to Recess the student will take part in the whole-class mathematics lesson. Then the student will work independently at Learning Station B until 12 noon, selecting her own activities. She will then bring her work to the teacher for feedback.

According to some advocates for differentiated instruction, it is because students learn in different ways and at a different pace that teachers must provide for individual needs through tailoring the curriculum, offering a variety of approaches, and creating alternative paths to learning (e.g., Gregory & Chapman, 2002; Tukey, 2002). However, despite the enthusiasm

with which experts recommend differentiation, it is actually incredibly difficult to implement and sustain an ambitious differentiated program over time. It places exceptional pressure on teachers to attempt this, and many do not succeed. Several studies have indicated that teachers know that they *should* modify their approach for some students, particularly those with disabilities, but find this very difficult to do (Schumn & Vaughn, 1991). However, effective teaching does require that teachers recognise and respond *as far as is feasible* to different aptitudes and learning needs in any group of students.

LINKS TO MORE ON DIFFERENTIATION

- For students of high ability. See online at: http://www.ctd.northwestern.edu/resources/downloads/talentw06.pdf
- One of the most useful websites is that of Greenfield School and Community Arts College. It also has links to other highly relevant material. Available online at: http://www.greenfield.durham.sch.uk/differentiation.htm
- Check the site for Enhancing Learning with Technology available online at: http://members.shaw.ca/priscillatheroux/differentiating.html

Cooperative learning and the use of groups

Under most methods of teaching, having your students working together in groups for some part of a lesson is regarded as a desirable strategy to use. Effective teachers make use of group work as a component in their overall approach. Working in groups not only increases students' active participation, it also encourages social skill development, enhances communication, and increases independence. Children working together, sharing ideas and learning from one another facilitates effective learning.

Careful planning is required if group work is to achieve the desired educational and social outcomes. The success of collaborative group work depends on the composition of the working groups and the nature of the

tasks set for the students. When utilising group work as a strategy it is important to consider the following basic points.

- The size of the group is important. Often children working in pairs is a good starting point.
- Initially there is some merit in having groups working cooperatively on the *same task* at the same time. This procedure makes it much easier to prepare resources and to manage time effectively.
- It is not enough merely to establish groups and set them to work. Group members have to be taught how to work together. They may need to be taught behaviours that encourage cooperation – listening to the views of others, sharing ideas, praising each other, and offering help to others (Doveston & Keenaghan, 2006).
- Choice of tasks for group work is very important. Tasks have to *require* collaboration and teamwork.
- The way in which individual tasks are allotted needs to be carefully planned and should be based on students' abilities.
- Teachers should monitor closely what is going on during group activities and must intervene when necessary to provide suggestions, encourage the sharing of a task, praise examples of cooperation and teamwork, and model cooperative behaviour themselves.
- Seating and work arrangements are important. Group members should be in close proximity but still have space to work on materials without getting in each other's way.
- Group work must be used frequently enough for the children to learn the skills and routines. Infrequent group work results in children taking too long to settle down.

Peer tutoring and peer assistance

Effective teachers also encourage peer tutoring in their classrooms. Peer tutoring can range from one student simply helping another at certain points during a lesson – for example by explaining or demonstrating again something the partner has not understood – through to highly organised systems of 'class-wide peer tutoring' (CWPT) where on a regular basis one student instructs another student or helps him or her revise a topic. As with

the group work described above, peer-tutoring situations help to build both social and communication skills, as well as contributing to a positive classroom climate. Research over two decades has supported the use of peer tutoring to enhance the learning of students of all ages and abilities (McMaster et al., 2006).

LINKS TO MORE ON EFFECTIVE TEACHING

- Garmston, R.J. (1998). Becoming expert teachers. *Journal of Staff Development, 19*, 1. Available online at: http://www.nsdc.org/library/publications/jsd/garmston191.cfm
- DfEE/ Hay McBer (2000). *Research into teacher effectiveness*. Report 216. London: The Stationery Office. Available online at: http://www.dfes.gov.uk/research/data/uploadfiles/RR216.doc
- North Central Region Educational Laboratory: *Teacher effectiveness*. http://www.ncrel.org/sdrs/areas/issues/content/cntareas/reading/li7lk15.htm
- North West Region Educational Laboratory: Cotton, K. (1995). *Effective schooling practices: A research synthesis update*. Available online at: http://www.nwrel.org/scpd/esp/esp95.html
- For a useful introduction to several of the main ideas in this chapter, read the excerpt from *Better teaching, more learning* (Davis, 1997). Available online at: http://www.ntlf.com/html/lib/btml_xrpt.htm

six

Assessment of learning

KEY ISSUES

- **Using assessment data to improve teaching:** Assessing students' current knowledge and skills should guide teachers' planning and instruction.
- **Forms of assessment:** Formative and summative; informal and formal; diagnostic; dynamic; curriculum-based; outcomes-based methods of assessment.

The only real indication that a teaching method is effective is if it achieves the program objectives and students actually learn. Students' learning, at the level of each individual, therefore has to be assessed and evaluated by one method or another. As McInerney and McInerney (2005) point out, assessment and evaluation are integral parts of the total teaching and learning process. Kauchak and Eggen (2007, p. 368) confirm that:

> The relationship between learning and assessment is clear and consistent. Students learn more in classes where assessment is a regular part of classroom routines, particularly when assessments are frequent and provide feedback to learners.

The terms 'assessment' and 'evaluation' are often used interchangeably by teachers, but assessment really refers to the process of collecting information from learners (e.g., obtaining test scores, work samples) while evaluation

means looking at that information and making some decisions in relation to instruction.

LINKS TO MORE ON ASSESSMENT

- Assessment in general: see North Central Regional Education Laboratory: http://www.ncrel.org/sdrs/areas/issues/methods/assment/as700.htm
- Additional information from: http://www.sasked.gov.sk.ca/docs/policy/studeval/chap4001.html
- Highly recommended: *Essential Learning Assessment Guide*. Department of Education (Tasmania) (2005). Available online at: http://www.ltag.education.tas.gov.au/ELsresources/Assessguide.pdf

Purposes of assessment

The main functions of assessment are:

- to enable a teacher to evaluate the effectiveness of the teaching program and then to make any necessary modifications to method of delivery, learning activities or resources;
- to identify any students who are having difficulties mastering the course content, and thus need additional help;
- to provide information if a student is to be transferred to another school or referred for special education;
- to be accountable to parents by providing them with evidence of their child's learning;
- to be accountable to government education authorities by providing hard evidence of achievement levels in a school.

In mainstream schools the most obvious method of assessment is through regular classroom testing and observation. At a more formal level, examinations may be used to gather data at half-yearly or yearly intervals. At an even more formal level there may be state or national testing, for example 'basic skills test' in Australian schools, or the National Assessment

of Educational Progress (NAEP) in America. These large-scale testing programs will not be considered here.

There are many methods other than testing for obtaining information on students' progress. Teachers may even use some of these methods as a lesson takes place. This ongoing type of assessment is referred to as 'formative', and can be contrasted with 'summative' assessment that comes at the end of a course of study. Formative assessment is particularly valuable because it allows a teacher to make immediate adjustments to the program of instruction when necessary (Stiggins, 2007). Summative assessment comes too late to influence the current teaching cycle.

Formative assessment

The most common ways of conducting formative assessments are by:

- observation of students at work
- appraising work samples, homework and portfolios
- interviewing students
- quizzes and informal testing.

Each of these processes will be described in more detail.

Observation

According to Airasian (2005), planned observation represents a very important and natural means of classroom assessment. Observations are often more useful than formal testing because they can be carried out unobtrusively and they yield information that more formal testing instruments cannot obtain. They also provide valuable supplemental information in such areas as the students' task-approach skills, application of knowledge, reasoning (synthesis and analysis), and problem solving. Borich (2003) regards observation skills as an essential aid to effective teaching.

Observation of students at work allows teachers to carry out what has become known as 'authentic' assessment (Burke, 2005). Authentic assessment uses the actual tasks students are required to engage in during lesson time, rather than using contrived tasks or test sheets set up artificially for assessment purposes. Linn and Gronlund (2000) comment that direct observation is the only means we have for evaluating some qualitative

aspects of learning and development. In particular, observation is important for assessing physical and social skills, work habits, attitudes, interests, and self-management.

Observation features also as part of '*dynamic assessment*', increasingly used with students who have severe learning problems. The term 'dynamic assessment' describes a situation where a relevant task is set for a student (e.g., using a protractor to measure the angles of a triangle). The student first attempts to do the work unaided. The teacher observes the performance, and if some aspect is deficient, decides quickly what information or skill the student needs to be taught in order to complete the task more efficiently. This information or skill is then immediately taught to the student, and then he or she is set a very similar task to attempt. The teacher observes the performance again and is able to note the extent to which the student has been able to learn from explicit instruction in the short term (Pressley & McCormick, 1995). If the first attempt at re-teaching has not been very effective, the teacher will try again, using a different method or providing additional practice time. Unlike standardised testing where exact procedures must be followed, with dynamic assessment the process is adapted and modified immediately in the light of the student's responses.

Observation may be carried out informally, or may be made more formal by adhering to a specified set of procedures or a checklist. Observation checklists are often based on a task analysis of the component skills needed for carrying out a particular process. For example, the assessment of a child's handwriting skill might involve the detailed observation of the child's pencil grasp, sitting position, position of the paper, movement of fingers, size and proportion of letters, linkages, etc.

A few examples of situations where planned observations can be useful include:

- listening to a student read aloud
- observing the strategies a student uses when attempting to plan and write a story
- noting how a student attempts to spell difficult words
- observing the way a student applies particular skills to a calculation, or how he or she tries to solve a mathematical problem
- observing the strategies a student uses when he or she encounters difficulty in completing any task.

It should be noted that for teachers' observations to be valid and reliable they must be based on an adequate and representative sample of the child's work or performance. Conclusions should not be made, and planning should not be carried out, with too little data.

LINK TO MORE ON OBSERVATION

- An interesting example from the field of physical education. Available online at: http://www.aber.ac.uk/~pedwww/observation1.html

Appraising students' work samples, homework and portfolios

Assessment of a student should include perusal of his or her exercise books each week to determine the amount of work the student typically produces in a lesson or for homework, the accuracy and quality of the work, and the consistency day by day. A single sample of work might indicate whether the student had achieved the particular objectives for the lesson, while several different samples over a period of time can be used to determine the presence or absence of improvement.

Encouraging students to collate and store work samples over time for later evaluation purposes is often termed *portfolio assessment* (Forster & Masters, 1996). The portfolio approach is particularly recommended in subject areas such as language arts, the expressive arts, and social studies where samples of written work may be used by students and teachers together as a focus when looking back, reflecting upon, and discussing previous efforts. Portfolios are also encouraged in other areas such as science and mathematics, where they can be combined with journal writing and notes containing personal reflections.

Herman and Winters (1994) point out that one potential weakness in assessing portfolios (particularly if they also contain homework) is that one may not know just how much help a student has received in the preparation of a particular piece of work. Does the work represent the student's unaided effort? Or has the student copied a draft that had been carefully corrected by a parent? However, even with this limitation, the

use of portfolio assessment has become popular, and the information gleaned from looking at a student's work can be used to supplement other types of assessment data.

Interviewing students

The assessment interview involves discussion between a student and the teacher, usually focusing upon work the student has been doing in the classroom and on test results. The interview allows for assessment of affective factors relating to the student (attitude, worries, beliefs, etc.) as well as cognitive and academic factors relating to the subject matter. Reys et al. (1998) describe an individual interview with a student as a powerful way to learn about a student's thinking and to give him or her some special attention and guidance. In a one-to-one interview it is possible for teachers to uncover concerns and misconceptions a student may have.

Quizzes and informal tests

Often teachers use a quick quiz or short test as one way of motivating students and revising work that has been taught. While it is not always possible to monitor closely each and every student's responses in a quiz, teachers can select certain students' papers to check and evaluate. Some benefits accrue when students learn from a quiz or test as they listen to the answers being checked. A limitation of this form of assessment is that it tends only to focus on factual information, rather than on the application or transformation of information.

Testing

It is interesting to note that in Australia in the 1980s the increasingly humanistic philosophy permeating schools saw many teachers abandoning tests because they felt that testing put children under too much pressure. They also claimed that tests did not really reveal what a student knew – and anyway, important things like attitude, interest and imagination could not be tested. Yates (2005) has an anecdote from this period. Some teachers approached him after a workshop session on effective teaching and told him that teacher effectiveness research findings would not apply to their

school because they were not 'into testing'. Since the 1990s, there has been a return to regular testing in most schools, due in large part to the call for greater accountability and monitoring of standards in education. There is some indication that the pendulum may have now swung too far in this direction in English schools, where a large-scale study reported in 2007 suggests that the national testing of 7- and 11-year-olds is causing major stress to both students and their teachers (Reuters, 2007).

Teacher-made tests

In reality there will always be an important place for formal and informal testing of students' knowledge and skills. Tests are used most effectively when they provide a quick indication of what a student can and cannot do within a course of study, and when they identify misconceptions or difficulties. For this purpose, teacher-made tests are often more effective than published tests. They must be linked closely to the objectives and content of the curriculum the students are following. Results will reveal concepts or skills needing to be revised or taught again.

Norm-referenced tests

Occasionally, testing might involve the use of standardised or norm-referenced tests. These tests provide an indication of a student's performance relative to the national average for his or her age group. They most commonly cover skills such as reading, spelling and mathematics. Results from such tests are expressed as attainment ages, standardised scores, percentile ranks, or quotients. Published tests have usually gone through rigorous trials and revisions to ensure that the final version really does test what it claims to test (validity) and that it provides consistent data over time (reliability).

Limitations of standardised tests include:

- they tend not to be directly linked with the content of a particular curriculum
- the diagnostic value of information from them is very limited and must be supplemented with data from the other methods of assessment.

Diagnostic tests

Diagnostic tests are designed to allow teachers or psychologists to explore a student's existing knowledge and skills in detail, and to detect any gaps or

weaknesses in prior learning. For example, diagnostic tests for arithmetic usually comprise graded sets of problems, each set representing a particular level of difficulty or a particular step in a process. The items are sequenced in complexity to enable the teacher to detect the exact point at which a student becomes confused and makes errors. The construction of such diagnostic tests is based upon a careful task analysis of the particular concept, skill or process.

In other cases, a diagnostic test may simply contain all the relevant information related to that domain of knowledge. An example would be a diagnostic test of phonic skills where all the letters and common letter-clusters are represented in the test items; or a list of commonly occurring words (Westwood, 2001b).

Diagnostic tests are usually only used with students who have learning difficulties, or appear to have reached a plateau in their development. When applying diagnostic tests the teacher is actually trying to find answers to the following five key questions (Westwood, 2007):

- What can the student already do without help?
- What skills and strategies has the student developed?
- What can the student do if given a little guidance or prompting?
- What gaps exist in the student's prior learning?
- What does the student need to be taught next in order to make progress?

Answers to these questions provide direct guidance for structuring the teaching program. The information can be gleaned from a combination of observation, evaluation of work samples, testing, and individual interview.

Curriculum-based assessment

Overall assessment of learning should be made with reference to the performance objectives already set for a particular unit of work. Assessment really involves obtaining an answer to the question 'Can the student meet this specific requirement, or not?' For example, take an objective which states: 'Given a picture in which various forms of environmental pollution are depicted, the students will (a) circle at least four of the five examples of pollution and (b) write a sentence suggesting how each form of pollution

might be prevented'. This objective makes the nature of the final assessment task very clear. It will be a straightforward matter to determine which students in the class have achieved the objective, and which have not. But, if the objective had indicated instead that on completion of the teaching program the students would be expected to obtain at least 80 per cent on a written examination containing questions about pollution, then the assessment method would involve a teacher-made test.

An effective performance objective leads clearly and directly to accurate assessment of learning. The objective should state *what* the student is required to do, the *conditions* under which it will be done, and the *standard* of performance required (Gronlund, 2004). Assessment based on objectives is commonly referred to as *curriculum-based assessment (CBA)* or *curriculum-based measurement (CBM)* (Hargis, 2005; Hosp, Hosp & Howell, 2007). Both CBA and CBM incorporate features of *criterion-referenced testing* in that they have a set 'standard' that each student is required to achieve. The criterion may be complete mastery of the content (100 per cent), or it may be set at something less, for example, 'at least 75 per cent', or 'at least four out of six problems correct'.

Curriculum-based assessment reflects the principle 'test what you teach, and teach what you test'. The results from curriculum-based testing are of direct value to the teacher in planning instruction. They reveal which students have not achieved mastery of the subject (and may therefore require additional instruction) and they inform the teacher as to the efficacy of his or her teaching of the subject. In particular, the results from CBA answer the question, 'Do I need to go back and re-teach some of this topic?' Many features of curriculum-based assessment are embedded in the mastery learning approach described in chapter 7.

Pressley and McCormick (1995) reviewed a number of different approaches to curriculum-based assessment and the impact of these procedures on students' learning. They reached the conclusion that students in classrooms where teachers use CBA tend to achieve at a higher level than those in classrooms where it is not used. They also note that at present CBA is used much more frequently in special education than in regular classrooms. They suggest that *all* teachers need to become aware of the benefits of closely monitoring each student's progress against precise performance objectives.

Outcomes-based education

The term *outcomes-based education* (OBE) has recently emerged in the professional literature. OBE is a response to the call for increased accountability in schools. The focus is on the setting of universal standards for what all students are expected to know and be able to do as a result of the instruction they receive in school. Indeed, OBE is also known as *standards-based instruction* (McMillan, 2007). The foundation of OBE is the philosophy that all students can learn.

OBE clearly defines the knowledge, understandings, skills, attitudes and values that students are to acquire as a result of the teaching they receive. The emphasis in OBE is on observable, measurable outcomes. The starting point has to be a clear idea of what is important for students to know and do; and then shaping the curriculum, teaching and assessment practices to ensure that this learning is achieved (Killen, 2002). It is difficult, of course, to reach a consensus on what every student should learn. Countries such as Australia and the United Kingdom have endeavoured to link student assessment clearly with the performance indicators set down for each key stage of learning in the various school subjects. This certainly provides a sense of direction for teachers.

Assessment should lead to improved teaching

Assessment, then, can take many forms and is an integral part of effective classroom teaching. Assessment enables teachers to obtain accurate information about their students' progress and their need for extension or remediation. Such information not only facilitates accurate reporting to parents and to education authorities, it also provides essential feedback to the teachers themselves on the quality of their instruction, and to students on their own progress. Regardless of the teaching method used to bring about particular types of learning, the outcomes from such teaching must always be evaluated on the evidence obtained from appropriate forms of assessment. The current perspective is that classroom assessment should lead to improvements in teaching and learning (Buhagiar, 2007; Stiggins, 2007). Assessment must lead to positive action.

LINKS TO MORE ON CURRICULUM-BASED LEARNING

- *CAST: Universal Design for Learning*. Available online at: http://www.cast.org/publications/ncac/ncac_curriculumbe.html
- *Wright, J. Curriculum-based assessment: A manual for teachers*. Available online at: http://www.jimwrightonline.com/pdfdocs/cbaManual.pdf

More on outcomes-based education

- A document from Western Australia provides a brief overview of the benefits of outcomes-based education, and indicates its application in various Australian states and territories.
  Online at : http://www.curriculum.wa.edu.au/files/pdf/147419_1.pdf

seven

The gap between research and practice

KEY ISSUES

- **Effective methods are not always adopted:** Although there is hard evidence to support the efficacy of certain methods of teaching, many teachers appear unwilling to adopt these methods. Why should this be so?
- **Teacher education:** University departments of methodology and teaching practice tend not to promote the teaching methods that have been validated by research, preferring instead to advocate methods based on child-centred ideology that have constructivist, developmental, social or humanistic appeal. Why?
- **Research-based methods:** There is a strong movement growing in the United States of America, the United Kingdom and Australia demanding that schools use only methods of instruction that have been validated by research. This is particularly the case for the teaching of basic skills in literacy and numeracy.

Given that there is a large body of research information indicating clearly the types of teaching that produce the best results in terms of students' achievement, it is relevant to wonder why so many teachers and some

education authorities seem reluctant to adopt such methods. Why are less effective methods preferred?

Research appears not to impress teachers

As stated at the beginning of this book, part of the problem is that much of the hard evidence from educational research is not read by teachers because it is published in journals that are not easily accessed by the profession. But even when teachers are presented with evidence from research, many of them seem inclined to reject it. They feel comfortable with their present way of teaching and they are often resistant to change. Adopting new teaching methods, such as interactive whole-class teaching or direct instruction, may be perceived as requiring more preparation and planning time, and may compel teachers to develop new presentation skills. Most teachers seem to prefer to remain within their comfort zone rather than accept the challenge.

Several writers have highlighted the gap that exists between research evidence of a method's efficacy and the adoption of that method by teachers (e.g., Carnine, 2000; de Lemos, 2007; Hempenstall, 2006; Lindsley, 1992; Yates, 2005). It is almost as if teachers are saying, 'OK. You say that research shows method X is more effective than any other, but we just don't like that method, and we won't use it'. Teachers seem inclined either to teach in the same manner that they were taught as children at school, or to follow popular trends, ideas, methods and materials that are presented to them during in-service courses promoted by their education authorities or professional associations. But even then, adopting new ideas or materials is only attractive if they can be incorporated into their present teaching style without too much effort, and if they appear to make the job of teaching easier.

Lentz (2006) reminds us that the field of education has a long history of being susceptible to fads and unproven methods, introduced with great fanfare, only to prove later that they have no value. Teachers seem attracted to such methods. Conversely, when methods have been shown to be highly effective there is a reluctance on their part to adopt such methods if they don't fit neatly within their personal teaching style or their philosophy concerning children's development and learning. This is clearly the case with most forms of direct instruction.

The situation in Australia is highlighted by de Lemos (2007, p. 7) who observes that:

> One fad follows another, and programs and policies are adopted on the basis of ideological belief rather than objective evidence as to their effectiveness. This may occur even in cases where there is strong evidence against a particular practice or policy based on ideological belief rather than the scientific evidence.

Hempenstall (2006, p. 83) goes a step further, remarking that the failure of the teaching profession to adopt research-based methods of instruction is due in major part to 'a science-aversive culture endemic among education policy-makers and teacher education faculties'.

Perpetuating the use of unproven methods

The problem in perpetuating methods that are not particularly effective stems not only from teachers' reluctance to change but also from the influence of education authorities and teacher-education institutions. State education authorities over the past 30 years have tended to support progressive methods that have some sort of intrinsic humanistic appeal, not necessarily methods that have been rigorously evaluated. Two typical examples are 'whole language approach' for literacy teaching that first swept Australia, the United States of America and the United Kingdom in the 1980s (and continues today), and activity-based 'process maths' that followed soon afterwards. Both were the focus of intensive in-service staff development courses designed to encourage teachers to adopt these more child-centred approaches. As examples of powerful in-service courses they were remarkably successful in influencing teachers' thinking and practices. Unfortunately, the teaching methods they were promoting had no research data to support them, and have since been openly criticised as weak approaches (e.g., DEST, 2005; House of Commons Education and Skills Committee, 2005; Rose, 2005).

Once an education authority puts its support behind a particular approach, guidelines for principals and teachers are promulgated to advance this chosen approach, and in-service teacher-development activities are used to promote the method for use in all schools. Inspectors and advisers are selected because they are strong advocates of the chosen method and

can influence teachers in schools and through in-service professional development workshops. In some 50 years of experience in the field of education I can think of no inspector, consultant or adviser who was ever appointed by an education department because he or she held views that were in opposition to the current wisdom of the day. Similarly, lecturers are appointed to faculties of education in universities because they are knowledgeable about the popular new approach. Indeed, many of the same inspectors, consultants and advisers follow a career path to become lecturers in education faculties where they continue to introduce student-teachers to the chosen method while expressing hostility toward any suggestion of alternative methods. And so the status quo is maintained. Farkota (2005. p. 11) wisely states, '…there is a dire urgency for the academics of the education world to put less emphasis on the ideology they feel most comfortable with, and have a long hard look at the evidence'.

Two effective models that are rarely used

It has already been noted that many teachers (other than those working in special schools) tend to reject the more extreme forms of teacher-directed instruction. But there are other examples of proven methods that are not adopted. One example is *mastery learning* (ML) (Guskey & Gates, 1986). In ML, students work to achieve a given set of objectives for the course – there is no differentiation of goals or content – but the *time* taken for individuals to accomplish this is allowed to vary. In other words, under ML the only significant difference among learners is the time it takes them to learn. Courses are divided into teachable and learnable units, and delivered by any appropriate method of instruction (including CAL). After each unit, all students are tested and those who can attain at least 80 per cent are deemed ready to move to the next unit. They are then given extension and enrichment work while those who did not reach mastery receive additional support in the form of re-teaching and guided practice. When these students have also mastered the unit, the whole group moves on. The evaluation of ML has shown it to be very effective (Cole & Chan, 1990); but it requires a high degree of planning and implementation that may be too daunting for most teachers.

Another excellent system that is totally ignored in teacher education courses and rarely used in schools is *precision teaching* (PT) based on the

ideas of Lindsley (1992). PT is not itself a complete method of instruction, it is a system to be used alongside any method to monitor its effectiveness. It has been used most in special education (remedial) contexts to assess the daily progress made by individual students. As with mastery learning, clear objectives are set and learners are taken through the lesson content with abundant guided and independent practice. Progress is determined quantitatively each day (e.g., number of pages read; number of words with correct spelling; number of lines written, etc.). The results are recorded on a daily progress chart. Practice continues until increments of progress reach the desired level. This writer can attest to the fact that PT can be very effective indeed in motivating lower-ability students to work hard in order to see progress developing on their charts. Cole and Chan (1990, p. 75) state:

> The key proposition in precision teaching is that regular and systematic evaluation of learning progress is the basis of effective instruction. Such evaluation allows for reliable judgement of the appropriateness of the teaching materials, the success of the instruction, and the need for modification to teaching procedures.

Perhaps ML and PT are not used because they are incompatible with the fairly unstructured lessons that are typical of child-centred constructivist approaches. The fact that they are not even presented at all to trainee teachers in their methodology courses certainly does not help facilitate their adoption in schools.

Perhaps the pendulum is beginning to swing

Even while teacher education institutions continue to base their methodology courses on constructivist principles and child-centred methods, there are a few signs emerging in some schools and in the professional literature that suggest a slight swing back toward direct teaching for some purposes and at some stages of learning. For example, in the science teaching domain there is a recommendation to move away from too much minimally guided learning to more explicit instruction *in the early stages* of introducing new topics, and particularly in relation to practical work in the laboratory (Li et al., 2006; Stefanich, 1998; Whitman & Evans, 2006). In this connection Klahr and Li (2005) suggest that direct and explicit

instruction, combined with experimentation using physical or virtual materials, is more effective than simply giving children opportunities for minimally guided discovery.

Similarly, in mathematics teaching there are signs of a slight swing back toward more explicit teaching of basic numeracy skills in the early stages, instead of using only investigative and activity methods from the start (e.g., Farkota, 2005; Greer, 2006; Hay et al., 2005; Westwood, 2008b). This is particularly the case in the United Kingdom, where fluency in computational skills is reaffirmed as an essential goal for all children. Some of the reasons for this return to 'the basics' in mathematics are discussed more fully in *What teachers need to know about numeracy* (Westwood, 2008b).

In the domain of teaching reading there has been an even stronger call for a return to direct teaching of basic phonic skills in the early stages (e.g., Coltheart & Prior, 2006; DEST, 2005; Ellis, 2005). The current situation seems to be a desire to redress the excesses of 'student-centredness' in the past decades by recognising the value of appropriate teacher direction and input (Scruggs & Mastropieri, 2007). Even some pre-schools seem to be acknowledging the same principle (Neuman & Roskov, 2005). Willson-Quayle (2001, n.p) has remarked that:

> [It] is clear that we should not assume that teacher-directed instruction has no merits nor that child-centered teaching (in its most liberal form) can do no wrong. Rather we should appreciate that teacher-directed and child-centered teaching are neither all bad nor all good.

Research-based methods

What has been most noticeable recently is a growing demand from several sectors of the education community for schools to use only 'research-based teaching methods' rather than methods that simply reflect the latest fad or teachers' personal whims or preferences. The *No Child Left Behind* legislation in the United States of America (2001) is often credited with first raising this important issue of selecting teaching methods of proven reliability and validity; but of course the importance of seeking such evidence was recognised much earlier (e.g., Brophy & Good, 1986; Kauchak & Eggen, 1989). In Australia and the United Kingdom the call for research-based methods emerged very strongly in the submissions made to the various

committees reporting on the teaching of reading (e.g., DEST, 2005; House of Commons Education and Skills Committee, 2005; Rose, 2005).

Research-based methods (also referred to as 'evidence-based practice') are those that have been carefully field-tested and evaluated using rigorous procedures to obtain hard data on their efficacy (Lentz, 2006; US Department of Education, 2003; Slavin, 2008). In Australia, Wheldall (2007) argues that new educational programs, methods and intervention strategies should all be carefully evaluated for their efficacy, and the resulting data made available to schools to guide decision making and classroom practice.

Education authorities surely have a duty to provide schools with concise summaries of studies that reveal the efficacy or otherwise of the teaching methods their teachers are using. Teacher education institutions also have a duty to present research-based teaching methods to trainee teachers. How else can improvements and refinements in education take place?

LINKS TO FINDING MORE ABOUT EVALUATING TEACHING METHODS

- Stanovich, P., & Stanovich, K. (2003). *Using research and reason in education: How teachers can use scientifically based research to make curricular and instructional decisions*. Portsmouth, NH: RMC Research Corporation. Available online at: http://www.nifl.gov/partnershipforreading/publications/html/stanovich/
- US Department of Education. (2003). Identifying and implementing educational practices supported by rigorous evidence. Washington, DC: Coalition for Evidence-based Policy. Available online at: http://www.ed.gov/rschstat/research/pubs/rigorousevid/index.html
- What Works Clearinghouse at: http://ies.ed.gov/ncee/wwc/
- Promising Practices Network at: http://www.promisingpractices.net/

Links to more on mastery learning and precision teaching

- Mastery learning, available online at: http://allen.warren.net/ml.htm
- Precision teaching, available online at: http://www.behavior.org/education/index.cfm?page=http%3A//www.behavior.org/education/education_precision_teaching_home.cfm

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Peter Westwood has been an Associate Professor of Education and has taught all age groups. He holds awards for excellence in teaching from Flinders University in South Australia and from the University of Hong Kong. Peter has published many books and articles on educational subjects and is currently an educational consultant based in Macau, China.

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