How Students Learn

George Brown

A supplement to the RoutledgeFalmer Key Guides for Effective Teaching in Higher Education series

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1 Introduction

The purpose of this online resource is to help you to think about how students learn, by providing you with outlines and commentaries on theories that seek to explain how students learn and how they learn best, and the implications these have for teaching. The guide includes the dominant perspectives of behaviourism and cognitive psychology which are often neglected in textbooks on teaching in higher education. It provides a platform for all the texts in the series 'Key Guides for Effective Teaching in Higher Education'.

The guide may be browsed so that you get a 'feel' for the topic. It may be downloaded and studied independently and it may be used as a basis for study by learning groups and discussion groups.

The key theories discussed in the guide are listed in Table 1.

Theories/Perspectives	*Key concepts*
Behaviourism	Building connections between stimuli and responses, task analysis and reinforcement. Relevant to course design, instruction and assessment.
Objectives, outcomes and taxonomies	The framework for course design and estimating levels of teaching and achievement. Strong links with behaviourism.
Gestalt psychology	Perception in learning, insight in problem-solving, importance of context, holistic learning. Relevant to organisation of learning materials, teaching understanding and problem-solving.
Experimental cognitive psychology	Learning is information-processing. The uses of memory: encoding, storage and retrieval. Relevant to teaching and all forms of learning.
Learning skills	Procedural memory, rules of procedure, goal-staking, limits of transferability. Relevant to teaching and learning practical, cognitive and social skills, course design and assessment.
Studies of student learning	Approaches to learning: reproductive learning, searching for understanding and 'strategies', effects of perceived contexts. Relevant to learning, teaching, assessment and course design.
Active learning	Active learning leads to improved recall and understanding. Implications for interaction in lectures, the use of learning tasks in seminars and the use of problem-based learning and projects.
Constructivism	Learners build schemata that enable them to construct meaning and understanding. Implications for teaching are to help the students to

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	develop more sophisticated concepts through the use of discussion and study tasks.
Reflection and experiential learning	Types of reflection, styles of learning and reflection on experience. Relevant to portfolios, personal development plans, self-assessment and related forms of learning.
Humanistic perspectives	Freedom to learn, autonomy, trust, consultation, negotiation, responsibility, ownership and reflection. Relevant to teaching, course design, learning and assessment.
Growth theorists	Learner as a person, personal growth, learning as achieving potential, changing perceptions. Relevant to the relationships between teachers and students and the learning environment.
Andragogy	Active, relevant, problem-based, learning contracts, reflection. Relevant to all forms of learning and student-centred teaching.
Self-directed learning	Managing one's own learning, autonomy, independent learning. Relevant to projects, portfolios, computer-based learning, problem-based learning, independent study, assessment and course design.
Student-centred learning	Stresses freedom and responsibility. Close relation to self-directed learning. Implications for teaching, use of enquiry-based approaches and assessment involving self, peer and collaborative methods.
Critical humanist perspectives	Enablement, empowerment, critical reflection, transformative learning, changing perceptions and changing environments. Relevant to course design, methods of teaching and learning and assessment.

Table 1 Theories of learning

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2 What is learning?

Answers to this question depend as much on the orientation of the definer as on the nature of learning. For a strongly committed behaviourist, learning is the modification of behaviour brought about by experience. For most cognitive psychologists, learning is the study of how information is sensed, stored, elaborated and retrieved. Others would stress the importance of meta-cognition (learning to learn), or reflection on experience as well as experience *per se*. Humanistic psychologists are more likely to insist that personal growth and development are at the heart of learning, while constructivists argue that learning is primarily concerned with how people develop different conceptions and constructions of reality.

These different views of learning are themselves examples of constructivism at work, of how different people view learning. Each view leads to a different emphasis and consequent neglect of other features of learning. Each view has different implications for course design, the tasks of the teacher, methods of teaching, the construction of learning opportunities and methods of assessment. Hence the importance of this guide.

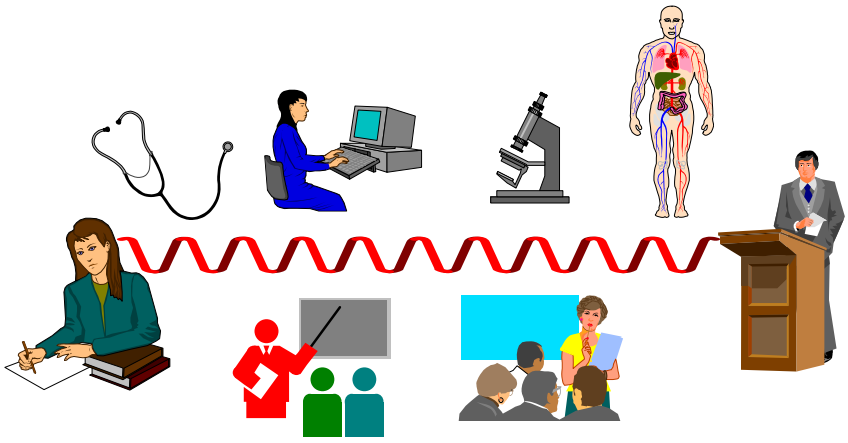

Figure 1 Contexts of learning

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3 How do students learn?

Table 2 Examples of students' conceptions of learning

1. *Learning as an increase in knowledge.* The student will often see learning as something done to them by teachers rather than as something they do for themselves.
2. *Learning is memorising.* 'Learning is about getting it into your head. You've just to keep writing it out and eventually it will go in.'
3. *Learning is acquiring facts or procedures that are to be used.* ''Well it's about learning the thing so you can do it again when you're asked to, like in an exam.'
4. *Learning is making sense.* 'Learning is about trying to understand things so you can see what's going on. You've got to be able to explain things, not just remember them.'
5. *Learning is understanding reality.* 'Learning enables you to perceive the world differently.' This has also been termed 'personally meaningful learning'.

When you have really learnt something, you begin to see things you couldn't see before. Everything changes.

Each of the above has implications for how students approach learning.

What are your views on learning? How do they influence your teaching?

Note: A nineteenth-century view was that learning was a mental discipline that developed the faculties of the mind and 'character'. For example, it was thought that classics and mathematics would develop the logical faculty and boring, dull, repetitive work would develop will-power. A residue of this view may be found in many courses in the twenty-first century.

Are there echoes of these views in your courses?

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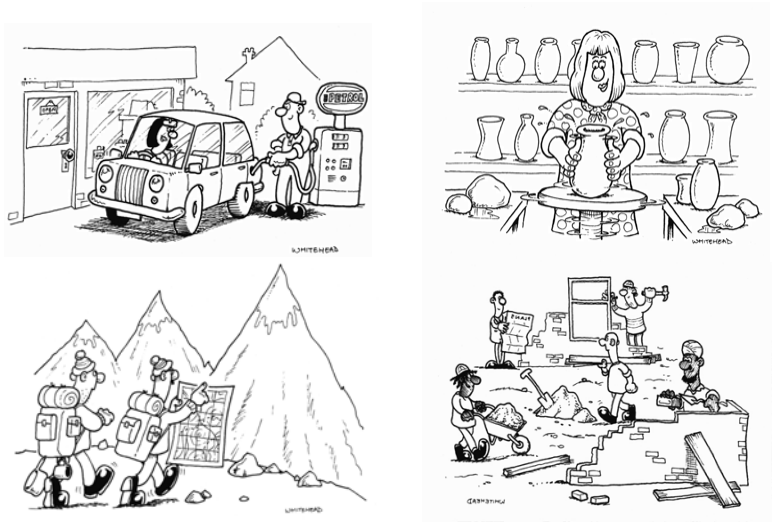

Figure 2 Different views of learning

Students learn, with varying degrees of success, through reading, memorising, thinking, writing, note-taking in lectures, observing, listening to and talking with others and by doing things. They may learn in structured situations such as lectures, courses or learning packages; in informal situations, such as browsing through books or on the Net; and through casual conversations with peers.

However, these above descriptions of how students learn do not *explain* how students learn, nor do they account for why students learn. For answers to these questions one has to turn to various perspectives and theories of learning. These may be placed on a continuum with behaviourism at one end and radical humanistic approaches at the other. In between are Gestalt psychology, cognitive psychology, studies of student learning, and constructivist, reflective, and humanist theories. As one moves along the continuum, the theories become less positivistic, less concerned with control and prediction and more ostensibly concerned with social values.

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4 Behaviourism and its legacy

Behaviourism is concerned with observable, *measurable* behaviour. For behaviourists, learning is the modification of behaviour brought about by experience. Its roots are found in early twentieth-century American psychology and time–motion studies in industries. Its first strong advocate was Watson (1913) and its next great advocate was Skinner (1973). Both held the view that inner processes such as memory, thinking and feelings had no place in a scientific psychology. Concern with introspection, the brain and the nature of knowledge were eschewed. To understand learning, all that was required was a careful analysis of the inputs (stimuli) and outputs (responses). All behaviour was learnt and anyone could learn anything provided the right conditions were created and they were not handicapped ('disadvantaged' or 'challenged' in current terms). Of such stuff was the 'American Dream' woven.

Three tenets underpin most forms of behaviourism:

1. *Learning consists of building connections between stimuli and responses*
   Initially, only responses to external stimuli were considered important.
2. *Task analysis*
   This consists of subdividing a task into its components so that objectives of learning can be set and, if necessary, the pre-requisites for tackling a task – what you must be able to do before trying to tackle the next task. The simplest components are taught first, reinforced and then built into increasingly complex hierarchies.
3. *Reinforcement shapes behaviour*
   Reinforcement consists of knowledge of result and 'rewards' for fulfilling the requirements of the task. Reinforcement schedules can be used to shape behaviour. An outcrop of this view is the use of rewards in the form of marks linked to achievement of 'intended learning outcomes'.

During the twentieth century, it was again recognised that internal states were important. Neo-behaviourism, a softer form of behaviourism, began to influence teaching. De Cecco and Crawford (1974) developed models for teaching concepts and Gagne (Gagne, 1985; Gagne, Briggs and Wager, 1992) developed a hierarchy of learning from simple stimulus–response through chaining of responses to principles and problem-solving. This model is the basis of some forms of instructional design. However, one should be wary of assuming that because a task may be analysed in behaviouristic terms, that is necessarily the best way of teaching it.

By the end of the twentieth century, the naive notion of stimulus–response psychology had withered. But 'behaviour' – what a person can do – input–output analysis, task analysis and reinforcement schedules continue to influence education and industry and are much favoured by government agencies and some senior managers of universities. The approaches permeate policies on course design, programme specifications, the use of learning outcomes, the National Curriculum in schools, issues of levels and standards, competency-based approaches, NVQs and related initiatives. Programmed learning and many, but not all, of

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today's computer-based learning packages are based on behaviouristic principles (Chin, 2004). So too are multiple-choice and sentence-completion questions. Performance indicators, targets, performance-related pay and the Research Assessment Exercise are all imbued with the principles of behaviourism.

The core ideas of analysing tasks, establishing objectives and administering systems of rewards are, of course, useful. Indeed they have been valued since at least the time of Aristotle. Task analysis can provide a better understanding of what is required, feedback can improve learning and assessment does influence student learning. However, criticisms have been made of the more extreme applications of behaviourism and of its underlying assumptions. Amongst these are:

- Behaviourism strips out the person from learning and reduces learning to bundles of stimuli and responses.
- The approach puts the teacher, instructor or learning programme at centre-stage, not the student.
- It is designed to produce passive compliance – 'By the end of the module you *will* ...'.
- The learner is someone to do things to. This leaves little room for the learner's own objectives in learning.
- Personal meaning and understanding are important, yet neglected by behavioural approaches.
- There is more to learning than following a list of outcomes, just as there is more to cooking than learning a list of recipes and oven temperatures.
- Behaviouristic approaches are a weapon of accountability.

You may not agree with all of these criticisms – but do you have good counter-arguments?

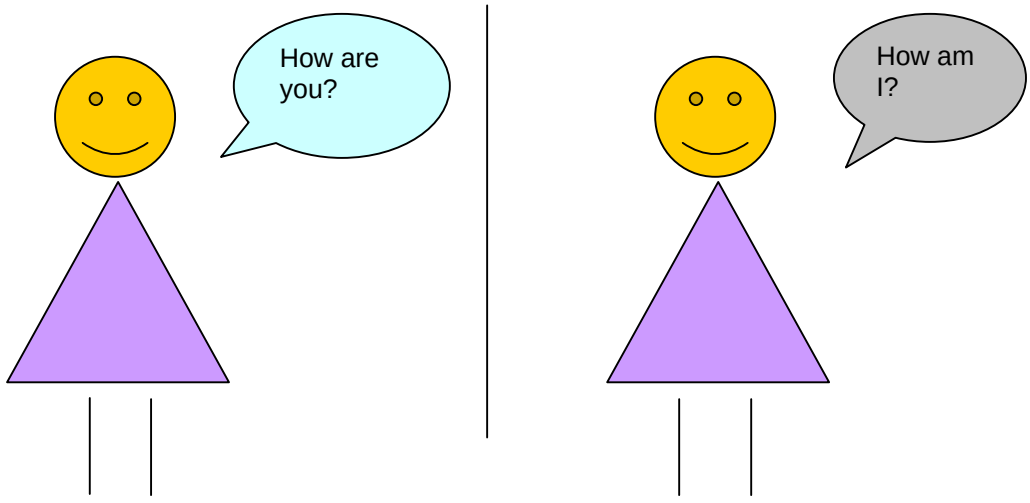

Figure 3 A behaviourist's greeting

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Implications for teaching and learning

The task of the teacher is to design and control the learning environment and the students' learning. On the basis of this assumption:

- Assess the entry behaviours of the students – what they can already do.
- Decide what you want the students to learn and express these decisions in the form of learning objectives/outcomes (see the next section).
- Analyse what is involved in the learning tasks.
- Develop a sequence of learning tasks that move from the simple to the complex.
- Design assessments and criteria that enable you to measure what the students have learnt in relation to your objectives.
- Use guidance, feedback and rewards to reinforce the key points of learning and the process of learning.

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5 Objectives, outcomes and taxonomies

Behaviourism and, to some extent, cognitive psychology have shaped current approaches to course design. At various times, the terms 'educational objectives', 'instructional objectives', 'behavioural objectives' and 'learning objectives' have been used. Each of these terms has a particular nuance. Behavioural objectives stress observable, measurable behaviours. Understanding is not acceptable – 'demonstration of understanding' is. Instructional objectives often referred to what the teacher would do to ensure what the student learnt. The current fashionable term is 'intended learning outcome', which is often abbreviated to 'outcome' and thereby loses much of its meaningfulness. These outcomes are usually considered to be broader than the detailed lists of behavioural objectives that were fashionable twenty years ago, but they share with learning objectives the notion of demonstrable behaviour and are usually expressed in the format of '*By the end of the module, you will be able to …*' followed by an active verb and, perhaps, a specification of context.

Leaving aside the optimism (or authoritarianism?) in the term 'will', there are difficulties in framing intended learning outcomes at different levels of a programme and in linking these outcomes across the programmes, modules and teaching sessions. The difficulties are in part due to the rigid framework imposed by the vocabulary of 'levels' and in part due to the assumption that all learning outcomes can be expressed in a hierarchy in which all lower-level outcomes can be deduced from higher-level outcomes. Such a hypothetical-deductive system works quite well in many of the sciences and mathematics but less well in the arts.

Other common criticisms of learning objectives and learning outcomes are:

- Detailed lists of objectives/outcomes are time-consuming to create and often unhelpful to teachers and students.
- The temptation is strong to list objectives/outcomes that are easy to measure.
- The requirement of a learning outcome might encourage students to seek to attain only the minimum standard.
- Long-term aims and objectives that cannot be measured immediately might be neglected.
- Learning outcomes are constraining: they can discourage creativity and exploration.
- Teachers might be judged, even paid, on the basis of how many students achieve the requisite learning outcomes – regardless of the abilities of the students.
- Learning outcomes might be incorrectly assumed to have the same meanings in different contexts.
- Students do not use learning outcomes as a guide to learning, so time spent on developing them is wasted.
- Often students do not understand the learning outcomes until they have completed the module.
- Learning outcomes are yet another method of accountability that limits the freedom of teachers.

Most of these criticisms are, in essence, caveats that should be borne in mind by teachers, course designers, programme evaluators and the Quality Assurance Agency (QAA).

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Notwithstanding such criticisms, broad, meaningful, intended learning outcomes can help students to learn. Most students have been through the assessment mill of GCSEs, AS and A levels so they are familiar with the uses and limitations of learning outcomes. The outcomes can provide a frame of reference for the students, provide goals, help self-evaluation and encourage them to take responsibility for their learning. Outcomes can provide a guide to teaching, help in the framing of appropriate assessment tasks and assist in the evaluation of a module or course. These considerations led to the development of 'constructive alignment' (Biggs, 1996) and to the suggestion that all the components of a course should be aligned (Brown, 2001). Figure 4 provides a simple model that is useful for considering the linkages between aims, intended learning outcomes, methods of learning and teaching, assessment tasks, criteria, marking and feedback. The criteria, if properly devised, provide an efficient and meaningful way of marking and providing feedback to students. The model is also useful for constructing and evaluating modules and programmes.

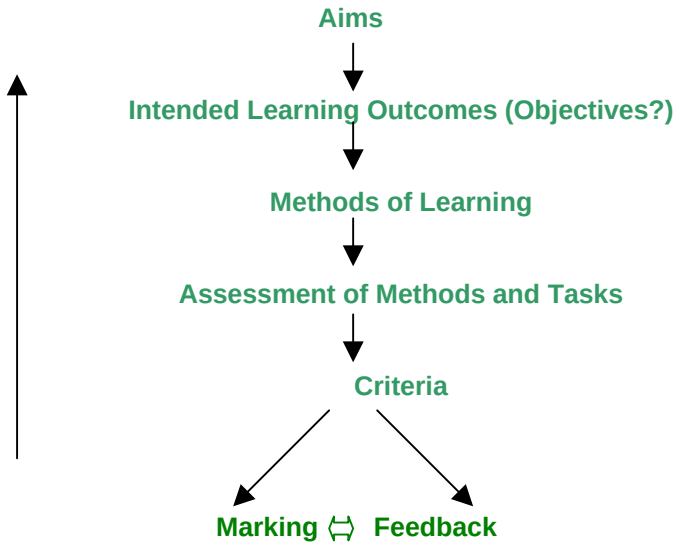

Figure 4 Curriculum Alignment

Taxonomies

Taxonomies of learning provide broad classifications, sometimes hierarchies, of skills or capabilities that can be useful as a guide to teaching and learning. Appendix One of Atkins *et al*. (1993) provides a useful classification of possible goals of universities and university courses, and the taxonomy developed by Carter (1985) provides a useful, extended framework for classifying and developing outcomes of learning in engineering which may be adapted for use in science and medicine. Wankat and Oreovicz (1993) describe a taxonomy for classifying problems in engineering and mathematics. Otter's text (1992) describes the approaches to the development of outcomes used by groups of lecturers in design, environmental science, social science, engineering and English that may be used in teaching and assessment. But perhaps the most useful taxonomy for most subjects was developed by Bloom (1965) for the cognitive domain. A brief description of the cognitive levels is given in Table 3. It provides a quick check on what levels of cognitive skills might be demanded in teaching and assessment. Each succeeding level assumes competence at a lower level.

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Table 3 Bloom's taxonomy of the cognitive domain

Level	*Ability*	*Description*
6	Evaluation	Ability to make a judgement of the worth of something
5	Synthesis	Ability to combine separate elements into a whole
4	Analysis	Ability to divide a problem into its constituent parts and establish the relationships between each one
3	Application	Ability to apply rephrased knowledge in novel situations
2	Manipulation	Ability to rephrase knowledge
1	Knowledge	That which can be recalled

Bloom's taxonomy has sometimes been used inappropriately for estimating levels of outcome by year! The abilities to recall and apply occur within level one, and to evaluate in level three. A more sensible use of the taxonomy would be *within* a teaching session or for developing criteria for an assessment task. For example, one might check that the level of questions asked in a seminar contains some of the higher levels of Bloom's taxonomy and that a lecture does draw the strands of an argument together and offer evaluative comments (Exley and Dennick, 2004a and 2004b). Put another way, at every level (year) there should be attempts to move the students through the hierarchy of Bloom's taxonomy.

Implications for teaching and learning

You will be constrained by your university's policy on learning outcomes. But within that framework, you might do the following:

- Set broad, meaningful learning outcomes for the module and for teaching sessions.
- State the learning outcomes at the beginning of a teaching session but do not state them in the formal way, ' By the end of this ...'.
- Vary your method of expressing the outcomes at the beginning of a teaching session.. Use a question or set of questions or outline goals, or sketch the purposes of the session.
- Use the outcomes as a guide for summarising the discussions in a seminar or the content of a lecture.
- Explore with students the meanings of the learning outcomes of a module.
- Explore with students the nature of synthesis and evaluation within your subject area.
- Show how the outcomes are connected to the content of the module, to the assignment and to its criteria.
- Use the outcomes to assist you to evaluate your own teaching.
- Use Bloom's taxonomy for preparing the questions you will ask in seminars.
- Check that some of the questions were of a higher order – and that the students' responses were too.
- Ensure that your lectures do have some of the higher features of the taxonomy.
- Use the taxonomy to check the types of questions you are setting in assignments and examinations.
- Use the taxonomy to check a sample of the students' assignments.
- Explore other taxonomies for classifying types of learning and learning outcomes.

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6 Gestalt psychology

Gestalt psychologists (*Gestalt* is German for 'configuration') in the early part of the twentieth century stressed that human beings were intrinsically motivated to search for patterns, organisation and meaning (see Wertheimer, 1968). They suggested that perception is organised into the following:

- *Figure–Ground relationship* – the ground is as important as the figure for understanding;
- *Contiguity* – proximity in space and time influences how we perceive;
- *Similarity* – items that are perceived as similar are grouped together;
- *Pragnanz* – we look for the 'best' possible pattern or form;
- *Transposition* – patterns or figures may be distorted but we can still recognise them.

The most famous maxim of Gestalt psychologists is that '*The whole is greater than the sum of the parts*.' In other words, the *relationships* between parts provide the key to understanding. As a corollary, a single part of the whole gets its meaning from the context in which it appears. Thus a statement in one context may have a different meaning in another context. For example, the learning outcome 'By the end of the module you will be able to state the main principles of scientific method' has different meanings in the context of the National Curriculum and in a postgraduate degree on the history of science..

Two equally important tenets are, first: '*What you see and hear is determined in part by what you already know*.' Thus the more you know about art, the more you can see in a painting; the more you know about literature, the more you will recognise in a poem by T. S. Eliot; the more you know about theories of learning, the more you will understand your students' learning and your own teaching. Secondly, '*Insight into a problem springs from the juxtaposition of percepts or ideas.*' This form of insight provides the basis of understanding, problem-solving and creativity. Percepts not precepts are the key to these processes.

Gestalt psychologists emphasised the importance of the whole learning experience, including perception, active searching for meaning and the learning context. These emphases led them to advocate the use of projects, open-ended experiments and self-directed learning. Gestalt theory and its approach have been neglected in mainstream psychology but they have had some influence on cognitive psychology, social psychology, humanistic psychology and some aspects of therapy. The principles provide some useful guidelines on organising learning materials and on teaching problem-solving and they provide a basis for the studies of student learning and constructivism that are discussed later in this guide.

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Diversions

Here are a few examples of Gestalt principles at work in perception.

Filling the gaps

In film and music, the observer or listener fills in the micro gaps from his/her previous experiences. Readers deal the same way with the spaces between letters. Read this:

Godisnowhere

Most people read this as ‘God is nowhere’. But it could be read as ‘God is now here’.

Shapes

Font shapes also have an effect. Read the following. Which is the more friendly?

Once upon a time
Once upon a time
Once upon a time
Once upon a time

Similarity influences the path the eye takes.

OXXXXXXX
XOXXXXXX
XXOXXXXX
XXXOXXXX
XXXXOXXX
XXXXXOXX
XXXXXXOX
XXXXXXXO

Which of the advertisements in Figure 5 would you trust? Why?

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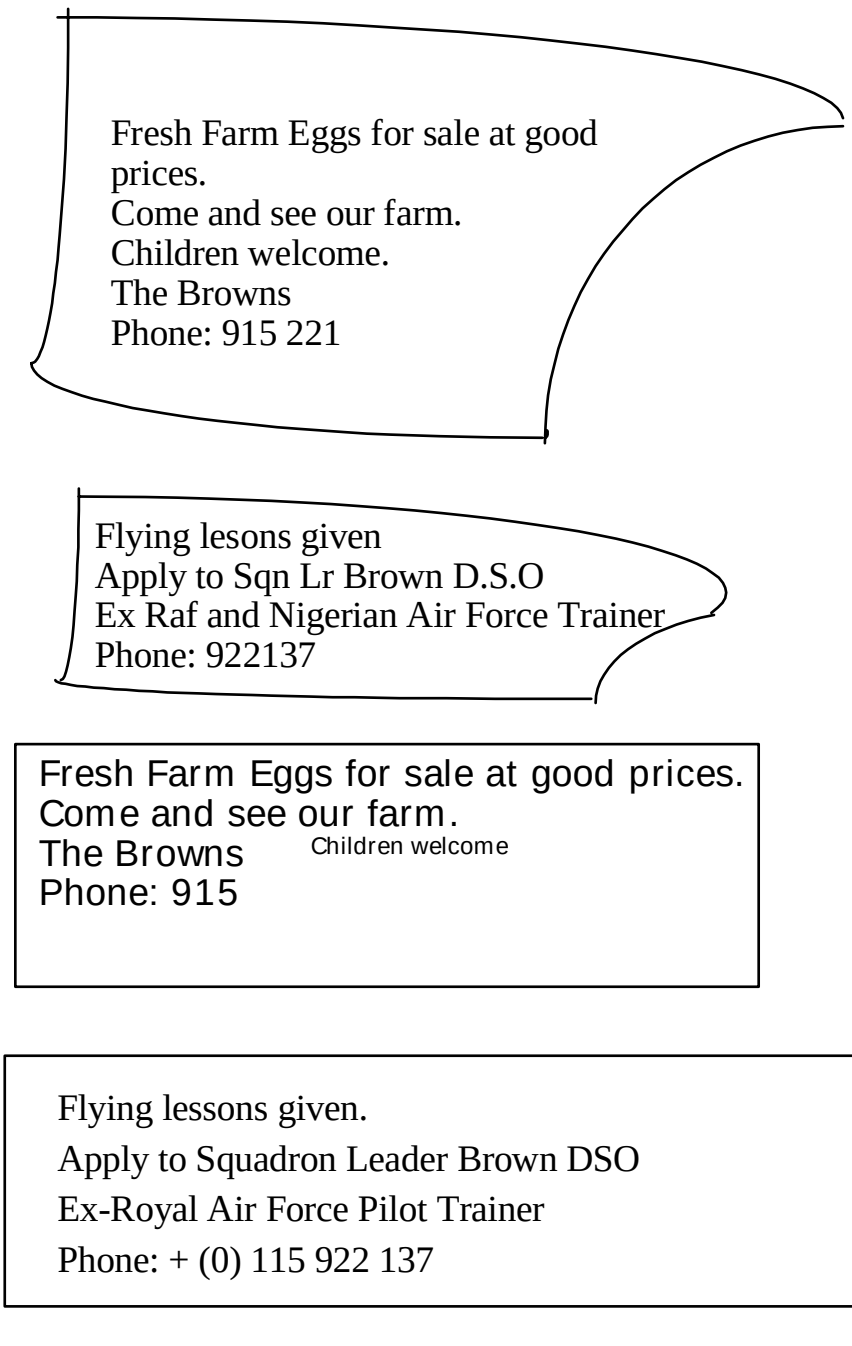

Figure 5 Reactions to advertisements

Here a combination of factors influences one's perceptions. One reacts initially to the total impact of an advertisement and then, perhaps, proceeds to analyse it. Often a similar process occurs when reading essays.

The design of handouts and questionnaires also influences students' responses to them.

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What do you see?

Figure 6 Background or foreground?

This figure demonstrates that we have a tendency to see one feature as the foreground and the other as the background. By changing one's viewpoint, one sees the picture differently. Is this an example of the germ of truth in post-modernism?

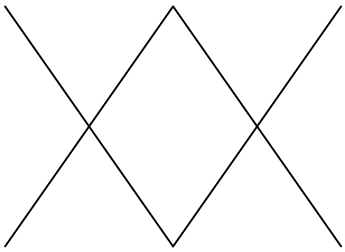

Figure 7 What different shapes can you see in this diagram?

Two crosses? Roman numerals for twenty? A 'W' and its reflection?
Two fish kissing cheek to cheek?

The diagram illustrates that what you see is determined in part, by what is salient in your mind when looking. The principle applies to reading, looking at a painting and listening to music.

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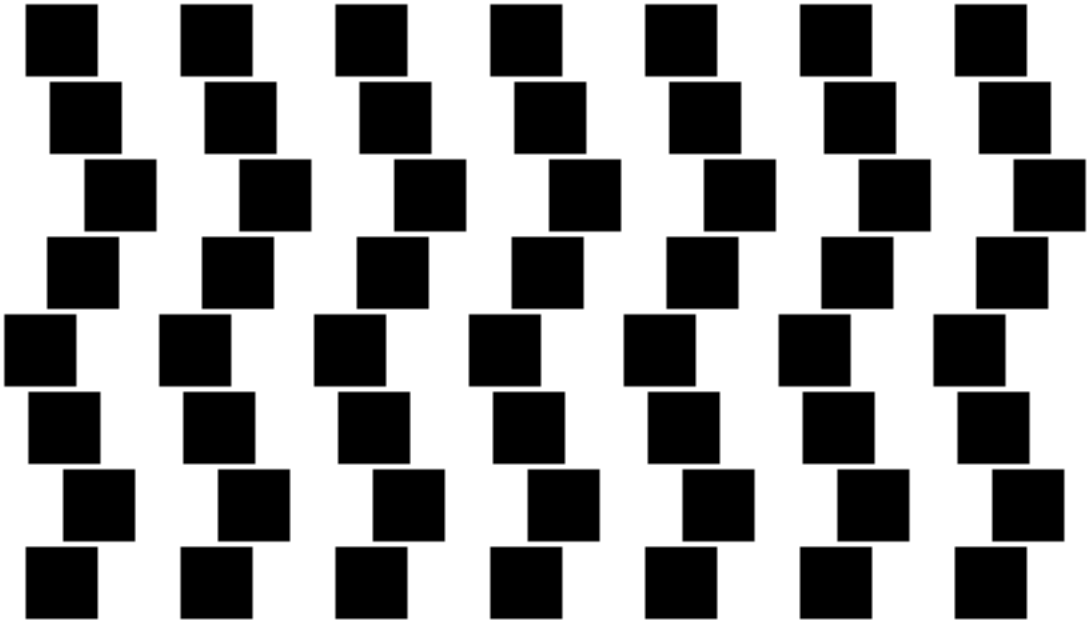

Figure 8 Context can distort objectivity

Sometimes one has to check carefully what one sees or studies. The horizontal lines are parallel.

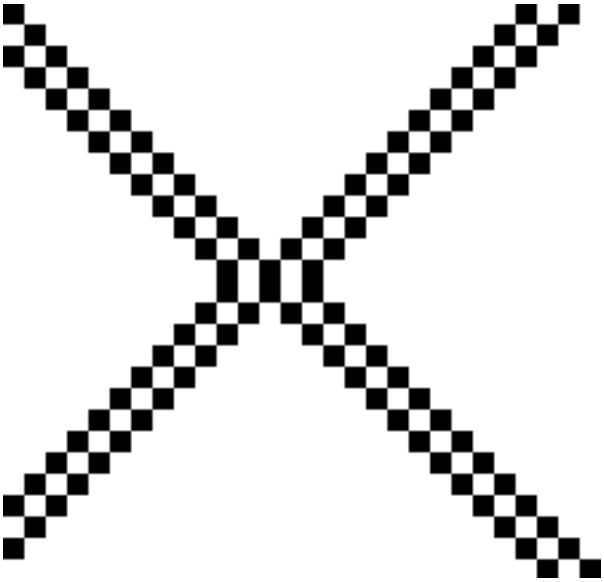

Figure 9 Contexts can colour views

The red squares in the upper and lower part of Figure 9 are the same colour but are seen differently because of the differences in background.

Are there implications here for showing how contexts can colour views?

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Figure 10 What do you see?

We try to make sense of what we see. At first one sees a set of smudges and then one can see a dog. Once seen, it is difficult not to see it – and one remembers it.

Gestalt psychology began with the study of perception but quickly moved into social psychology, therapy and the study of problem-solving. A famous example of insight learning is provided by the work of Wertheimer (1968) on the area of the parallelogram.

Most teachers used to teach the proof that the area of a parallelogram is equal to its base x altitude through the use of Euclidean geometry. They began with the formal definition of a parallelogram as 'a plane quadrilateral whose opposite sides are equal and parallel' and then proceeded through extensions of lines and drawing perpendiculars to the use of identical triangles and the formula for the area of a rectangle and thereby proved that the area is equal to the base x altitude. Wertheimer argued that one should begin with intuitive understanding and insight and then use various shapes and sizes of parallelograms before proceeding to the formal proof. He began the lesson by asking children to draw a parallelogram, cut it out and

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then find a way of making the parallelogram into a rectangle. After several similar tasks, he taught the proof. More pupils understood the proof and more were able to apply the theorem to different situations. There are implications here for teaching concepts and proofs in the sciences, engineering and mathematics – particularly to less able students. Wertheimer's approach influenced constructivism (to be discussed later) and the study of problem-solving.

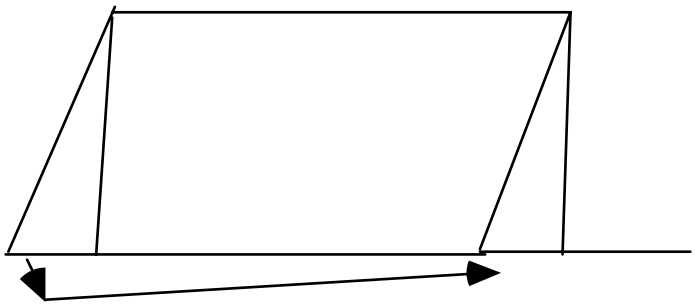

Figure 11 The area of a parallelogram

Context is important for understanding

Read this passage and try to decide what it is about:

> The procedure is actually quite simple. First you arrange items in different groups. Of course one pile might be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities, that is the next step, otherwise, you are pretty well set. It is important not to overdo things. That is, it is better to do two things at once than too many. In the short run this may not seem important but complications can easily arise. A mistake can be expensive as well. At first the whole procedure will seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then one can never tell. After the procedure is completed, one arranges the material into different groups again. They can be put into their appropriate places. Eventually, they will be used once more and the whole cycle will then have to be repeated. However, this is part of life.

Most students who read this passage without prior knowledge of the topic thought it was incomprehensible. Another group who were told the topic *before* they began reading it, understood the topic and remembered many more ideas from it than the first group. Knowledge of the context enabled them to make connections within the passage and to the topic of the passage. This experiment by Bransford and Johnson (1972) in cognitive psychology illustrates the Gestalt principle of context. It has implications for assessment, writing, giving lectures and organising seminars and assessment.

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Implications for teaching and learning

- Set the teaching session in the context of the module. Use an opening that provides a meaningful context to learning.
- Show how topics are connected. Better still, devise tasks that encourage the students to search for connections.
- In small group sessions, explore their concepts and misunderstandings through problems, discussions and feedback.
- Devise methods of developing intuitive understanding of a concept or complex procedure before teaching it formally.
- Teach problem-solving initially through insight learning rather than formal proofs and their application. Help students to explore the connections between different types of problems.
- Use simple, visual approaches and language familiar to the students to explore and show connections and links between and within topics. This suggestion applies to history and English literature as well as to sciences, engineering and medicine.
- Encourage students to think holistically about an issue or problem and to explore how contexts influence and sometimes distort meaning.
- Design handouts and e-learning that highlight key features and provide alternative perspectives.

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7 Experimental cognitive psychology

A quiet revolution in psychology occurred in the 1960s. Many psychologists became less interested in pigeons pecking rye or rats running mazes for rewards. These activities had led them down some blind alleys. Human experimental psychologists began to study meaningful learning rather than nonsense syllables. There was a renewed interest in how human beings learn and think. The mind re-emerged as a focus of study.

This 'new' cognitive psychology regards learning as information-processing (Baddeley, 1999). This can be defined as the study of how information is sensed, perceived, encoded, stored and retrieved. Advances in neural science provided an understanding of the physiological and biochemical bases of learning, and analogies with computers were used to explain, not always successfully, how memory works and how problems are solved. This interest in computers led to the development of artificial intelligence and cognitive science, which are largely concerned with expert systems, decision theory and attempts to model human learning and actions.

The main, but not exclusive, interest of cognitive psychologists has been memory, for it is memory that provides the basis for all learning and performance. Without a memory we could not learn to walk or speak, read a book, solve problems or dream. Indeed, we could not survive.

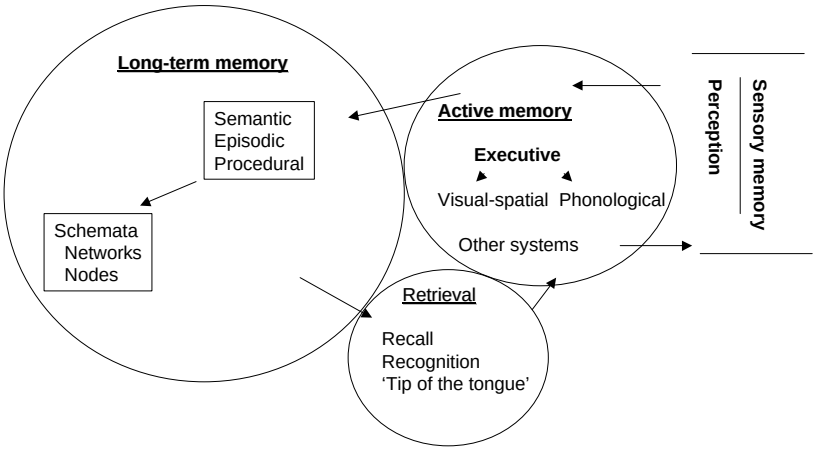

Figure 12 A simple model of memory processes

A simplified model, based on recent views of memory, is shown in Figure 12.
Sensory memory has a capacity of about two seconds. Information gained in this time is transferred electrically to the working memory, which consists of a central executive and various subsystems such as the visual-spatial and the phonological. The latter is concerned primarily with sounds and, in particular, the sounds of words. Information is encoded in the working memory and transferred neuro-chemically to the long-term memory. Information

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stored in the working memory, whether auditory or visual, lasts for less than half a minute unless it is refreshed. Its channel capacity is about seven chunks of information but information in the working memory can trigger other relevant memories stored in the long-term memory. The long-term memory contains various schemata (singular: schema) which consist of networks of ideas, facts and experiences. Sometimes these are classified as semantic memory, which contains ideas and facts, episodic memory which stores incidents and personal experiences and procedural memory, the basis of skills. The memory systems (sometimes regarded as processes) are interlinked. An alternative classification sometimes used is based on procedural knowledge such as using a word-processing package and declarative knowledge such as the key attributes of a particular novel or the signs and symptoms of pneumonia. The boundary between these memory processes is blurred.

The retrieval mechanism is triggered more easily by recognition than by recall, but recall can also be triggered by retrieving information from a significant node in the episodic memory. For example: What were you doing on 11 September 2001? (*Stop and think.*) Many people can remember what they were doing because this information is linked to a significant event through the episodic memory. 'Tip of the tongue' phenomena refer to those memories that seem just beyond access to the working memory. We know we know the information, but we cannot recall it. Retrieval is based on the working memory and it could be regarded as another process of the working memory. What is in the long-term memory affects encoding in the working memory and therefore what you can see, hear and do.

For a long time it was thought that forgetting was due primarily to traces in the long-term memory decaying, but experiments on recall and recognition suggest that memories may be stored permanently. The major deterioration occurs in the working memory and the retrieval mechanism. As you can see, memory is much more complex than a one-way process from sensing to retrieving

Evidence and ideas from various studies of memory suggest the following conclusions:

Activating the appropriate schemata before learning something new eases the process of learning and retrieval.

The method of encoding affects storage.

If new information is encoded separately it is likely to remain inert or attached to only a few loosely related networks. If the encoding is based on the existing network of ideas (schemata) then the information is more readily assimilated and, usually, more easily retrieved. New information may change the schemata but the precise conditions when this will occur are hard to predict.

As new concepts and facts are integrated into the cognitive networks, new, richer connections are made in the mind of the learner.

This is the basis for the development of understanding. But understanding is a dynamic process, not an end product. It is not dependent solely on quantity of knowledge but on the

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strength and validity of the interconnections created. Active processing is required to deepen understanding.

The method of encoding information affects retrieval.

If you have learnt a set of facts as a list, it is difficult to retrieve the facts in a different order. (*Try saying the alphabet backwards.*) Hence the importance of retrieving information in several different ways so the schemata become more flexible. In other words, one has to go beyond learning lists to actively processing information in different ways. If the learning task is meaningful or can become meaningful, through active searching (thinking), then it is more easily retrieved.

The context in which learning takes place can prompt retrieval.

Returning to the place we learnt something can prompt recall. Most of us have had the experience of going out of a room to get something and then forgetting what we were looking for. On returning to the room we often remember. Just recalling the place where we learnt something can also prompt recall.

Practice with feedback (knowledge of results) improves learning – providing the learner understands and acts on the feedback.

Time spent on tasks is closely correlated with improvements in practice.

However, there are some qualifications to this bold statement. Time spent on blind practice is unlikely to be effective. Active analysis and reflection are necessary conditions. Simply repeating information in the working memory will not improve retrieval. One must repeatedly store and retrieve the skills or ideas from the long-term memory and use them in different ways so the schemata are elaborated and fine-tuned. ‘A little, often’ is a good maxim for learning.

Learning lists does not improve the ability to learn other lists.

The memory is not like a muscle that needs exercise. However, reflecting on how you learn lists and developing strategies for learning lists of facts or ideas can improve your learning.

The use of external memories, such as ‘to do’ lists, notes, and databases can improve learning providing they are organised in useful ways.

And finally:

> *You can get a great deal from rehearsal*
> *If it just has the proper dispersal.*
> *You would just be an ass to do it en masse:*
> *Your remembering would turn out much worsal.*

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(Quoted by Baddeley, 1999: 76)

These findings from experimental cognitive psychology may be linked to the work of educational psychologists, such as Ausubel (1978), who have a strong interest in cognitive learning. In common with many others, Ausubel stressed the importance of prior learning, a view that is substantiated by reviews of research (Dochy, De Rijdt and Dyck, 2003). Ausubel advocated the use of 'advanced organisers', which orient a student towards what is to be learnt, preferably through concrete examples. These organisers are sometimes likened to scaffolds or bridges that link previous knowledge to the new knowledge being acquired.

Implications for teaching and learning

The combination of the research of experimental cognitive psychologists and Ausubel's work on meaningful learning is rich with implications for studying, preparation for lectures (Exley and Dennick, 2004b), seminars (Exley and Dennick, 2004a) and e-learning (Chin, 2004). Here are just a few of the many suggestions which can be deduced from cognitive psychology.

Studying

Reading, revising, problem-solving, thinking and writing are all enhanced by intentionally activating the schemata before, during and after these activities. This activation makes the schemata more responsive and receptive to new and previously stored memories. The match or mismatch between what you have retrieved and what you are studying can change your schemata and eases the processes of elaboration and retrieval.

Preparing teaching materials

The same principles apply as above. Ascertain, if possible, what the students already know. Think about purposes and possible content before you read. This approach will make your preparation more efficient and will provide you with guidance on what to read and reformulate. Neglect of this approach can lead you to spend too much time on reading (the 'must read more' syndrome) and not enough time on structuring the materials. After teaching, spend a few minutes reviewing the teaching session and note the changes to be made.

Lecturing

The model of memory is full of applications to lectures (see Brown and Manogue, 2001; and Exley and Dennick, 2004b). Orienting the students and activating their schemata will improve their learning. Given the limitations of sensory and working memory, do not talk too quickly, but 'chunk' the information provided into meaningful and relatively brief sentences. Too fast or too distracting PowerPoint presentations cannot be processed by the working memory. The use of analogies, metaphors and similes will create new connections rapidly with existing schemata. The use of frequent summaries, guiding statements and cognitive maps can help students to change their schemata, which can then be elaborated upon by the

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student after the lecture. Personal narratives interwoven with concepts and findings can trigger the episodic memory and the semantic memory and thus aid the storing and retrieval of information. Thus, storing, retrieving and understanding can be improved by explaining aspects of disease in relation to a patient, recounting one's initial attempts at solving problems with vector mechanics or describing how one changed one's views of a historical or literary interpretation.

Small group teaching

Learning through discussion, if managed well (Jaques, 2000; Exley and Dennick, 2004a), helps students to alter their schemata, to elaborate and fine-tune their concepts and values. At its best, small group teaching leads students to reconstruct their conceptual bases. Probing questions, reflective questions and 'thought' questions can all contribute to this process. So too can the psychological and physical environments in which learning takes place

Practical and professional work

Laboratory and field work benefit from regular practice of different related tasks in different experimental situations. The challenge in most professions is to integrate schemata based on experience and schemata based on theories and research findings. These links are probably best developed simultaneously rather than by learning 'theory' for a few years and then 'applying' it to practice.

Learning languages

Regular, distributed practice is important. Total immersion is effective provided it is followed by reinforcement. Frequent and varied use of linguistic constructions ensure that the schemata are flexible and responsive to new situations. Create links between the known language and the unknown language through use of different constructions, origins of words and phrases as well as vocabulary.

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8 Learning skills

'Skills' provide an alternative way of conceptualising how students learn. It is not a perspective that everyone is comfortable with, partly because of its association with manual skills and narrow vocational skills, partly because it seems to undervalue academic work and partly because the concept of skills is not well understood.

From a psychological standpoint, skills are goal-directed, learnt sequences of actions that once learnt are routinised. When learnt, they have built-in feedback mechanisms that enable us to adjust our actions to the task in hand. It is only if the sequence is disrupted that one has to consciously change one's actions. Skills may be broadly classified as predominantly psychomotor, such as setting up a centrifuge; predominantly cognitive, such as reading a book; and predominantly social, such as teamwork. Skills are learnt through practice supported by knowledge of results, reinforcement and reflection on the task.

The principles derived from experimental cognitive psychology apply. For most skills, the best advice is to practice meaningful wholes, practice a little, often. Practice intensively sequences which include the weak spot – not the weak spot alone. Distributed practice is more likely to be efficient, so there is time for consolidation in between practices. Expect plateaux in learning, occasional regression to lower levels of performance and occasional peaks. These principles apply to a wide range of skilled activities in higher education including reading, writing, problem-solving, doing practical work, learning a foreign language and discussing ideas.

The major characteristics of all skills are *fluency*, *rapidity*, *automaticity*, *simultaneity* and *knowledge*. Fluency is brought about by chunking and overlapping sequences of action. When writing fluently, the next sentence is being formulated in the pre-conscious as one writes. Simultaneity refers to the ability to co-ordinate the components of a task simultaneously, such as playing piano with both hands, or performing one task automatically while doing another task, such as listening to a student while formulating the next set of questions to be asked. Knowledge for skills is concerned with retrieving the appropriate knowledge at the appropriate time in the appropriate context.

Thus cognitive psychologists who study skills are interested in production rules, production systems and goal-stacking for the working memory. These concepts are relevant to students' organisation of learning and to your own work. You may have rule systems for preparing a lecture, reading a research paper and retrieving information from a book. If you don't have the book, you may have a stack of goals – leave your study, go to the library, look at the catalogue, find the book. As one goal is reached, the next goal comes to the top of the stack. However, in pursuit of one goal, such as going to the library, another goal stack may be prompted, such as seeing a friend, and the original goal stack may be discarded – or forgotten temporarily.

In academic life, one is often pursuing different goals including preparing for seminars, teaching, assessing, research, administration and personal maintenance. All of these have

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goal stacks and managing the goal stacks could be regarded as the meta-skill of academic life – and one which should be learnt early. The skill involves engineering your time and environment so that you remember to carry out your tasks at the right time, in the right order and in the right place.

Are skills transferable?

In higher education there are frequent references to core skills, generic skills, personal skills and transferable skills. All of these terms imply that skills are generalisable and transferable across contexts. But are they?

To answer this question it is useful to distinguish between *low road* transfer and *high road* transfer. Low road transfer occurs when tasks and contexts are closely similar. If a person learns to drive one type of car, it is probable that he/she will be able to drive most other types of car. Such transfer is most likely to occur when learners attend to the deep characteristic of the skill and context. Unfortunately, some learners attend only to surface characteristics and so do not transfer their skills. For example, some students do not recognise a formula if a different notation is used. Some students may not be able to solve a problem because it is in a new context and others commit the same errors of reasoning and presentation from one essay to the next.

High road transfer refers to the intentional application of previously acquired skills to new tasks and situations. The skills taught in universities and schools are often assumed to transfer in this wide decontextualised manner. The evidence for such transfer is weak (Cox, 1997). Indeed the overwhelming weight of evidence indicates that:

- Transfer is most likely to occur when a person understands the underlying principles.
- Knowledge and understanding of different contexts are necessary for transfer.
- The probability of transfer is maximised by providing a wide variety of learning tasks and assessment.
  (Resnick and Nelson Le-Gall, 1997, Bowden and Marton, 1998)

In short, the key to successful high road transfer is variability. We have to prepare the students for the unknown through varying the known.

Some issues

There are conceptual issues associated with the current usage of ‘skills’ in higher education. Amongst these are:

- Classification of skills into subject-specific and personal transferable skills.
- Assuming that a skill that is labelled ‘transferable’ will actually transfer.
- Assuming that the same term has the same meaning in different contexts.
  (Problem-solving in history is different from problem-solving in histopathology. Writing in sociology is different from writing in English literature.)
- Attempts to produce hierarchies and levels of skills.

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- Skills always involve content and context – they are not learnt in a vacuum.
  (Modules concerned with 'study skills or 'personal skills' have a content. The closer the content is to the subject being studied in the programme, the greater the likelihood of transfer.)
- Every academic subject has its own concepts, structures, truth criteria (what counts as evidence) and methods of study.
  (Much of higher education is concerned with socialising students into the ways of thinking in a subject through providing them with the opportunity to develop the skills needed for the different modes of thinking. Indeed, this is often one of the primary purposes of studying an academic subject so a student, one hopes, will learn to think like a 'physicist', 'engineer', 'lawyer' or 'historian'.)

If the doubts about evidence and the conceptual issues of transfer continue to be confirmed, it will call into question much of the current thinking about course design and programme specifications. However, skills, as a heuristic concept within a subject, do have a place. They *can* provide a useful focus for teaching, learning, assessment and course design. The dangers arise if one believes that they share exactly the same meaning in all subjects and that they are readily generalisable and transferable.

Implications for teaching and learning

Here are a few of the many implications for teaching and learning that can be derived from the study of skills:

- Provide practice with guidance and feedback of the skills that you wish to develop in your students. This precept applies to all skills from the delicate use of a hand-piece in dentistry to the subtle nuances of writing an essay on Derrida.
- Analyse the skills to be learnt and begin with the simpler, meaningful tasks.
- Vary the tasks and contexts so that students gain a rich experience of different applications of skills in different contexts. For example, to develop the writing skills of students, one might set various tasks that require paraphrasing, summarising different views, arguing for and against a viewpoint and drawing out the implications of a viewpoint.
- Explore with students the underlying concept of the skills you want the students to develop. For example, some students have an inadequate grasp of the skills of discussion and others seem unaware of the skills involved in problem-solving.

A useful method for developing high-level practical skills in science and medicine is the four-stage model based on principles derived from the study of skills (Peyton, 1998). This consists of four stages:

Stage 1 Demonstrate the skill at normal speed, with little or no explanation.

Stage 2 Repeat the skill more slowly, with full explanation and encouragement to the learner to ask questions.

Stage 3 Demonstrate the skill with the learner providing the explanation of each step and the demonstrator asking relevant questions and providing necessary corrections.

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This step may be repeated several times until the demonstrator is satisfied that the learner understands the skill.

Stage 4 The learner then carries out the skill under close supervision and describes each step before it is taken.

The first stage of the process enables the learner to focus on what is required. The second stage of the process allows the skill to be divided into simpler steps and allows the learner to ask questions. The third stage is designed to build the confidence of the learner and to clarify any aspects of the skill. The fourth stage is designed to help the learner to perform the skill accurately. It should be noted that the skills taught must be demonstrated three times before the learner reaches the fourth stage.

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9 Studies of student learning

Experimental cognitive psychologists base their findings on carefully controlled experiments and well defined external measures such as items recalled or reaction times. In contrast, the well known studies of student learning (Marton, Hounsell and Entwistle, 1993; Entwistle, 2000) in the late twentieth century were based on introspectionism, phenomenology and Gestalt psychology. The researchers asked students to report their perceptions and interpretations of a task. From this modest beginning, Marton and his co-workers at Gotheburg developed the notion that students adopt deep or surface approaches to learning. They developed an approach known as phenomenography. This work was used by Entwistle and his co-workers to develop various learning inventories. The main characteristics of these contrasting forms of learning are shown in Table 4.

Table 4 Approaches to learning

Surface approaches – reproductive learning

- Intention is simply to reproduce parts of the content
- Accepting ideas and information passively
- Concentrating only on assessment requirements
- Not reflecting on purpose or strategy
- Memorising facts and procedures routinely
- Failing to distinguish guiding patterns and principles

'Deep' approaches – the search for understanding

- Intention to understand material for oneself
- Interacting critically with the content
- Relating new ideas to previous knowledge and experience
- Relating evidence to conclusions
- Examining the logic of an argument
- Using organising principles to integrate ideas

Bowden and Marton (1998) argue that the deeper approaches lead eventually to changes in perception of the subject of study and, perhaps, to changes as a person.

A third approach to learning was also identified. This has been labelled 'strategic'. Strategic learners are concerned about getting the best marks possible, whether the material is interesting or not. They adopt the deep or surface learning strategy according to their perceptions of the task. They organise their time and working space efficiently and choose appropriate readings or tasks that they think will enable them to get the best marks. The current assessment system favours strategic learners.

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Other evidence indicates that a student's approach to learning is not determined solely by their method of study or the method of assessment. One needs to consider the organisational climate of the department or school as well as its use of various approaches to teaching and assessment (Entwistle and Tait, 1990; Ramsden, 1992).

There is a tendency to infer from the studies of student learning that the reproductive orientation is always inferior to the search for deeper understanding. However, reproductive knowledge should not be dismissed out of hand. Knowing what and knowing how are often as important as knowing why. For example, a neurologist needs to know the specific neurological function of the optic nerve before he or she can make a diagnosis of a particular patient; a historian needs to know the terms of the Treaty of Versailles before attempting an analysis of Germany's problems in the 1920s. It seems more helpful therefore to encourage students to develop efficient strategies of reproducing knowledge and deepening their understanding.

Implications for teaching and learning

The studies of student learning are rich with implications for course design, teaching and assessment. Approaches that are likely to foster deep learning include independent learning, projects and group projects, dissertations, problem-based learning, active learning, reflection on learning and the deliberate development of deep approaches within a subject area in a special module.

Within one's own teaching, one can:

- In lectures: introduce active learning tasks and provoke thought through the use of questions and alternative perspectives. (Exley and Dennick, 2004b)
- In seminars: prepare and use challenging questions, set intriguing problems and provide guidance and feedback on deeper approaches. (Exley and Dennick, 2004a)
- In laboratory work: reduce the number of routine experiments and encourage students to design and conduct their own experiments. (See Brown, Bull and Pendlebury, 1997)
- Use study guides, or e-learning, as an alternative to lectures, which contain deep questions and demonstrate ways of approaching them. (Chin, 2004)

How one assesses students, in particular the criteria that one uses, can have a powerful effect on students' learning. So too can the design of the module and the learning climate. So it is worth examining the content, approach and assessments that you are using in a module. Are these encouraging reproductive approaches rather than deep approaches? Is active learning valued in your department or school?

Finally, it is worth pointing out that it is easier to induce a reproductive approach than a deep approach. Given the range of abilities of students entering higher education, it is unlikely that all students will become deep thinkers but, if the above approaches are used, they might become deeper thinkers.

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10 Active learning

Active learning is not so much a theory as an injunction. Evidence from cognitive psychology together with everyday observation indicate that students who are actively engaged with their learning are more likely than passive learners to recall and demonstrate their understanding of a topic. If the learner is actively involved, then more connections will be made both within previous learning and between previous learning and new concepts.

The physiological basis for such activity could be summarised as '*neurones that fire together, wire together*'. Active approaches to learning stimulate the reticular activating system which then sensitises existing networks to the processing of incoming information. A neat example of this principle is provided by some research on London taxi drivers. It appears that these drivers, who have learnt detailed routes in London (known as 'the Knowledge') have larger hippocampi, which store the neuronal versions of the maps, than other London drivers (Maguire, Gadian and Johnsrude, 2000). However, one needs to be clear that active learning is not merely activity. It is activity with a clear purpose to engage in learning. Nor is active learning necessarily overt. Covert activity, such as listening carefully in seminars, is at least as important.

Implications for teaching and learning

The implication is simple to understand, difficult to do. Ensure that your students are engaged in active learning in your classes and in their study time. Set some tasks that involve interaction with others. Provide some choices for students so they gain a sense of ownership of their learning. Use some of the suggestions given in the previous section on 'Studies of student learning'.

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11 Constructivism

Constructivists argue that we learn through building schemata to interpret the world; as the schemata become more sophisticated, so does our understanding of the world. Central to the notion of constructivism is that view that experience and knowledge are filtered through the learner's perceptions and personal theories. The process is dynamic. As new knowledge is assimilated, it is fitted into the existing schemata until there comes a point when new experience and knowledge are in conflict with the existing schemata so the schemata change – or the new knowledge is rejected. This basic idea of earlier forms of constructivism owes much to the work of Piaget and Vygotsky (Jarvis, Holford and Griffin, 2003) and the methods of study of constructivists are similar to those of the phenomenographic researchers (Marton, Hounsell and Entwistle, 1993) mentioned in the section on studies of student learning. These approaches have been used to study students' conceptions of fundamental laws and principles. That research indicates that students, particularly those who are surface learners, retain primitive concepts that obtrude in their thinking and problem-solving. For example, most students can recite Newton's Law that 'every force has an equal and opposite reaction' but many cannot use it to explain why an object falls to the ground when you let go of it. (See Laurillard, 1993; Prosser and Trigwell, 1999; and Steffe and Gale, 1995 for examples of the misconceptions of students in different subjects.) The implications of this research is that analysis of errors and misunderstandings can provide valuable information for teaching (Exley and Denick, 2004a and 2004b). Feedback that merely tackles surface errors may not be sufficient.

Implications for teaching and learning

The role of the teacher is to help students to explore and develop their constructions of the subject which they are studying. This may be achieved through:

- Ascertaining and activating prior knowledge and existing concepts through discussion, tasks or the use of mind maps. This process activates the schemata and ensures the mind is ready for new learning.
- Creating a supportive climate in which students feel safe enough to reveal their conceptions of what they are studying and how they study.
- Helping the students to deconstruct existing concepts and rebuild more sophisticated ones through the use of challenging questions, problems, tasks, discussion and study guides.
- Encouraging students to think and reflect on the processes of learning in their subjects and their underlying epistemologies. Every subject has its own ways of thinking, core concepts and ways of perceiving the world, which students need to develop if they are to gain expertise in their subject. For example, questions such as 'What is history?' or 'What is entailed in the study of microbiolgy?' are worth exploring with students in these subjects.

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12 Reflection and experiential learning

Reflection on experience is now used widely as a tool for improving learning. It is a justification for portfolios, personal development files and learning logs. Student are also expected to report their reflections in dissertations and theses. But students need practice and guidance to develop reflective skills, and there are dangers in asking students to reflect too early or too broadly. The role of the teacher is to teach, guide and encourage reflection and to assess the capacity to reflect on learning. The latter task is not easy. A suggestion will be offered later in this section.

Neither reflection nor experience *per se* necessarily leads to learning or good teaching. There is an old adage that some people have twenty years of experience of teaching and others have one year's experience repeated twenty times. Reflection needs to be followed by action. Nor is the empirical basis for reflection and experiential learning as strong as its advocates suggest. Most research on reflection and experiential learning is based on students' reports that reflection on experience has helped them to learn. There do not appear, as yet, to be any carefully controlled studies based on independent measures of learning gains. A substantive review of the literature on the efficacy of reflection and experiential learning is sorely needed. Until there is such a review, one must rely on one's intuitions and the arguments put forward by advocates of reflection and experiential learning..

Of these advocates, one of the most influential was Schon (1983, 1988), who developed the notion of the 'reflective practitioner'. He argues that professionals must learn how to frame and reframe the complex and ambiguous problems that they face and then interpret and modify their practice as a result. He distinguishes reflection *in* action, which is akin to immediate decision taking, and reflection on action, which provides a longer and, perhaps, deeper view. To these might be added reflection *for* action (see Cowan, 2000).

Kolb (1984) adopted a similar stance. From his studies of the professions and academic subjects, he developed the argument that learning is the process of transforming experience into knowledge, and he suggested that learning is more effective if it is based on the learner's own experience. He proposed that when people reflect on their learning, they can develop a theoretical understanding of it, apply it to new situations and repeat the cycle.

Different approaches to learning are associated with the phases of the learning cycle are. His experiential learning model has four phases: concrete experience (CE), reflective observation (RO), abstract conceptualisation (AC), and active experimentation (AE). The model provided the basis of his Learning Style Inventory, which measures a learner's preference for specific phases of learning. From these, it is possible to identify four learning styles: Converger (AC/AE), Diverger (CE/RO), Assimilator (AC/RO) and Accommodator (CE/AE). Figure 13 illustrates how reflection on the outer, 'real' world influences the inner world and how reflections on one's inner world can influence one's perceptions and structuring of the 'real' world. Figure 14 shows the relationships between the styles of learning in Kolb's model and Figure 15 provides a brief summary of the characteristics of Kolb's styles of learning. Most people have a mixture of styles with one or two styles predominating.

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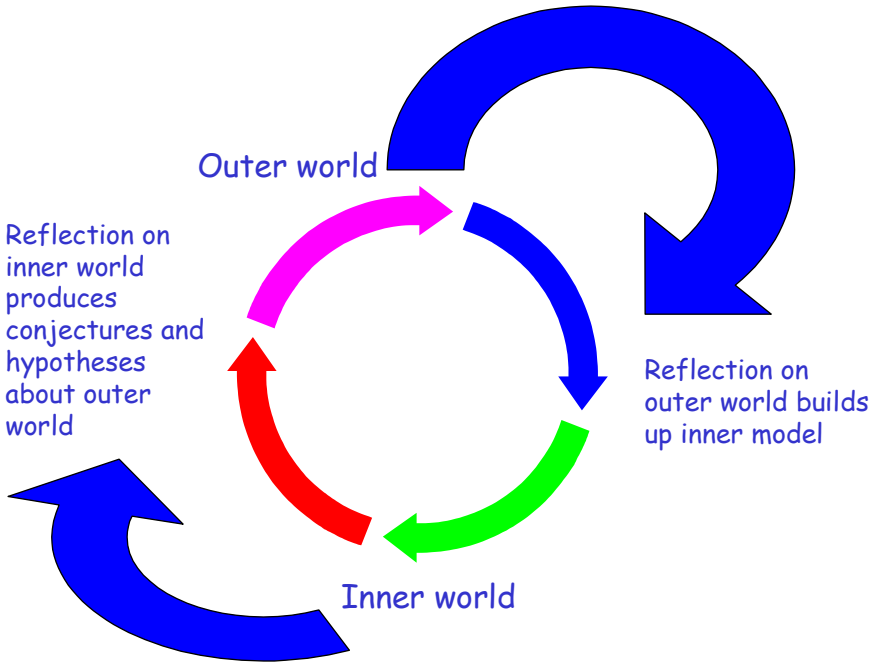

Figure 13 Reflection on experience

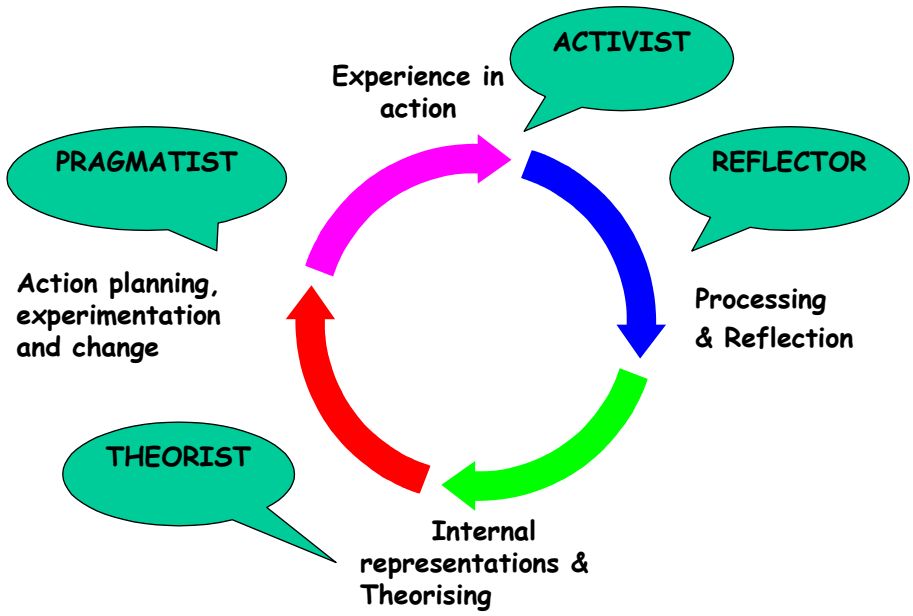

Figure 14 Kolb's Experiential Learning Cycle

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Convergent (AC/AE). Strong in the practical application of ideas, problem-solving, and decision-making. Thinking converges on the solution of a question or problem, prefers the hypothetical-deductive method. Performs well when there are single correct answers. Orientated towards technical tasks and problems rather than people or social issues. Characteristic of many engineers.

Divergent (CE/RO). Strong in imaginative ability and awareness of meanings and values. Good at viewing situations from many perspectives and attempts to see the whole picture. Thinking generates alternative ideas and implications. Good at brainstorming. Interested in people and their feelings. Broad cultural interests. Characteristic of many teachers of humanities.

Assimilation (AC/RO). Strong ability to create theoretical models by synthesising varied observations into an integrated explanation. More concerned with logically sound abstract ideas than people or translation of ideas into practice. Characteristic of scientists, mathematicians and computing scientists.

Accommodation (CE/AE). Strong on doing things. More of a risk taker. Performs well when required to quickly adapt. Enjoys new experiences. Solves problems intuitively or by trial and error, often using other people's knowledge. Theories are easily discarded and are subordinate to practical issues. Individuals are at ease with people but are often seen as 'pushy'. Characteristic of many people in action-orientated subjects such as marketing, business and sports sciences.

Figure 15 Learning styles (Kolb, 1984)

Honey and Mumford (1986) simplified Kolb's categories and made the Learning Styles Inventory more user-friendly. Their inventory produces a profile based on the following:

- *Activists* seem to learn best from short 'here and now' activities and least from those that require a passive role.
- *Reflectors* do not like to be rushed. They prefer to learn through assimilating information, reflecting on it and their experience and reaching decisions in their own time.
- *Theorists* prefer to integrate observations and experience into a theoretical framework. They dislike situations and tasks that they do not have the opportunity to explore in depth.
- *Pragmatists* seem to learn best from activities when they can see the practical value of the subject matter and when they can test ideas and techniques in practice. They dislike learning that seems unrelated to an immediately recognisable benefit or need.

As diagnostic tools, the inventories of Kolb and of Honey and Mumford have much to offer. They can be used in the assessment of prior learning, personal development plans, self- and peer assessment and the use of learning profiles. They may be used to encourage students to reflect on their approaches to learning and by small groups of students to consider the group's profile of learning styles (Exley and Dennick, 2004a). The profile could help them in the allocation of tasks in group projects and in team work.

Assessing reflective learning

As indicated earlier, assessing the capacity to reflect is not easy. One approach that may be useful springs from the research of Hatton and Smith (1995). They identified four levels of reflection in students' reports:

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- *Descriptive writing* in which no reflection is evident.
- *Descriptive reflection* in which some reasons, based on personal judgements, are provided.
- *Dialogic reflection* in which a student explores possible reasons and approaches which may be rooted in their reading of the relevant literature.
- *Critical reflection* that involves exploring reasons and approaches and the underlying assumptions and concepts. The exploration is based on an evaluation of the context and takes account of social, personal and historical influences.

The above categories could provide a basis for criteria for assessing students' capacity to reflect on their learning.

Finally, although reflection is a valuable tool, it can be overused, particularly as a method of assessment. If you do become over-enthusiastic about its use, remember the words attributed to Plato: '*A wise man learns from experience, an even wiser man learns from the experience of others.*'

Implications for teaching and learning

- Explore with students their conceptions of 'reflection'.
- Provide examples and discuss with students how to reflect.
- Set simple, concrete tasks that require self-assessment.
- Set tasks that involve peer feedback.
- Set assessments that involve self-, peer and collaborative assessment (feedback between tutor and student).
- Provide and discuss guidance on how to do and reflect on group projects. Include such questions as:
  - What do we need to do?
  - How well are we doing?
  - How could we have done better?
  - How could we have worked more effectively together?
- Build into projects and work-based projects the requirement that the students should reflect on their experiences.
- Encourage students to make connections between their reflections, theories and other people's experiences.

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13 Humanistic perspectives

Within this broad field are subtle differences of emphasis, but they all stress freedom to learn, autonomy, trust, consultation, negotiation, reflection on experience and giving choice and responsibility to students for their own learning. First and foremost, the learner is a person with his/her own aspirations and needs. The views of advocates of this approach are in marked contrast with those of behaviourists.

Growth theorists

Two psychotherapists, Maslow (1968) and Rogers (1983), who were influenced by Gestalt theory, are usually attributed with the development of this perspective. They were particularly concerned with personal growth and the notions of self, self-esteem and self-actualisation rather than cognition *per se*. Both take the optimistic view that human beings are propelled to reach for higher levels of development and, given the right conditions, they will flourish. Maslow proposed that it is only when the basic needs of survival are satisfied that the higher needs of self-esteem and self-actualisation (personal growth) become operative. His theory of needs is, at first sight, appealing. A student who is tired, cold, hungry, anxious or threatened is unlikely to achieve full potential. On the other hand, students who are well nourished and secure do not always realise their potential and some students rise above their disadvantages and do succeed.

Rogers stressed that students need freedom to learn and that students thrive when the teacher has a genuine, personal relationship with them, when the teacher prizes, accepts and trusts students and develops an empathic understanding with them. The role of the teacher is to facilitate the learners, to help them to make choices and to guide them (Exley and Dennick, 2004b). However, while there is evidence that freedom in learning is essential for intellectual development, there is also evidence that too much freedom too early may not help a person to develop, but rather brings about acute anxiety and distress (Stevens, 1990).

Andragogy

The major contributor to theories of how adults learn is Knowles (1990). He developed guiding principles of ‘andragogy’, ‘the art and science of adult learning’, based on assumptions about how adults learn. These principles may be summarised as adults learn best when learning is:

- active
- self-directed
- based on problems
- related to their experience
- perceived as relevant to their needs
- intrinsically motivated.

The principles that he advocates are:

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- Develop a learning contract with the learners.
- Establish an effective learning climate.
- Encourage learners to diagnose their 'learning' needs.
- Encourage learners to develop their own objectives.
- Involve learners in planning methods and content.
- Support learners in carrying out their learning plans.
- Encourage learners to reflect critically on their own learning.

These principles provide a rationale for the use of portfolios, personal development plans, problem-based learning and self-directed learning (Haines, 2004). However the empirical basis of Knowles's approach appears to have been tested on predominantly 'middle-class' learners (Tough, 1983; Merriam and Cafarella, 1999). It resonates with democratic values but one might question whether his assumptions are true for *all* adults, including students. Nor are these principles applicable only to adults, for they are explicit in the writings of many childhood educators who pre-date Knowles.

Self-directed learning

Self-directed learning has at least four meanings: personal autonomy, the ability to manage one's own learning, independent learning outside of formal institutions and lifelong learning (Candy, 1991). All of these are possible goals of learning rather than methods whereby students learn. The methods suggested for self-directed learning are projects, dissertations, group projects, case-based learning and problem-based learning. These methods are based on the assumption that students learn best when they are given some choice and responsibility for their own learning and when they are encouraged to think reflectively, critically and creatively. The role of the teacher is to create a learning environment in which these characteristics are promoted. This argument is supported indirectly by studies that show that perceived freedom to learn is associated with deep approaches to learning (Ramsden, 1992) and by reviews of problem-based learning that demonstrate that students become more active, independent and deeper learners than their counterparts who are learning in conventional courses (Boud and Feletti, 1998)). The theoretical justifications for self-directed learning are in line with the main tenets of humanistic perspectives given in the introduction to this section. Fuller discussions may be found in the works of Dewey (1933), Knowles (1990) and Candy (1991).

Most lecturers would agree with the goals of self-directed learning. The argument centres on what the best methods are for achieving these goals. Traditionalists argue that self-directed learning can be a waste of valuable curriculum time, that one should provide students with a good grounding in the subject and leave self-directed learning to later in the programme or after graduation. Innovators argue that methods of self-directed learning should be used from the outset so that students learn to be independent and to do 'research' as part of learning. In this way they will become better equipped to sustain self-directed learning in later life. Beneath these viewpoints there is a deeper question: How much freedom should be given at each stage of a course? Choices could be given, in ascending degrees of freedom, at the level of criteria for assessment, assessment tasks, methods of learning, learning outcomes and content. Choices at each of these levels could be open or restricted.

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Student-centred learning

A close relation to self-directed learning is student-centred learning. The essential features of student-centred teaching are freedom of choice, students' responsibility for their own learning and the creation of a supportive environment in which students can develop their potential. The role of the teacher is to guide and facilitate learning rather than to control it. The perspective provides a rationale for the use of problem-based learning, project-based learning and other enquiry-based methods of learning. It is argued that these characteristics promote lifelong learning. This perspective is often presented as a contrast to didactic teaching. Table 5 shows some of the polarities usually ascribed. The 'Teaching Approaches Inventory' of Prosser and Trigwell (1999) provides a basis for estimating whether one tends to be student- or teacher-focused in one's teaching.

Table 5 Student-centred versus teacher-centred characteristics

Student-centred	*Teacher-centred*
Focuses on what the student does to learn	Focuses on what the teacher does to teach and what the student should do
Students' experience as well as their knowledge is considered	Focuses primarily on increasing students' knowledge
Students take key decisions on what to study and how	Teacher takes key decisions on what to study and how
Students take key decisions on choice of assessment task and criteria	Teacher takes key decisions on assessment task and criteria
Feedback is primarily concerned with helping students to improve	Feedback is primarily concerned with telling students whether they have fulfilled the assessment criteria
Assessment and feedback include self-, peer and collaborative assessment	Assessment and feedback do not include these approaches
Active learning	Passive learning
Deep learning	Surface learning
Problem-based	Discipline-based
Emphasises development of understanding and constructions of meaning	Emphasises transmission of knowledge
Concerned with meta-cognition – with learning how to learn	Not concerned with meta-cognition
Uses enquiry-based methods such as projects, dissertations and portfolios	Does not use enquiry-based methods
Emphasises reflective learning	Emphasises reproductive learning
Develops autonomy	Develops conformity

Occasionally one hears that the use of learning outcomes and transparent criteria are examples of student-centred learning. These features fit equally well into a didactic approach. What distinguishes student-centred learning from teacher-centred learning is the emphasis on the student as a person to develop rather than an individual to train. Indeed, it is difficult to reconcile the features of student-centred teaching with a top-down outcomes-driven model of

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learning. As for the perspective on self-directed learning, questions arise concerning the degree of freedom of choice and responsibility students should have for their own learning. There is also the issue of trust: What, given freedom, will students learn? Some of the questions which need consideration are:

- Should all modules and programmes be totally student-centred?
- If yes, what happens to learning outcomes and programme specifications?
- Is there not a role for some didactic teaching?
- Should students be required to dig and delve for *all* their knowledge?
- Does this approach run the risks of wasting time and developing misconceptions?

Perhaps the best guide through these thorny questions is: '*Programmes and modules that contain no student-centred learning are as bad as programmes and modules that contain only student-centred learning. In media res.*'

Critical humanist perspectives

There are dangers in the focus of growth theorists on changing a person, his or her attitudes, perceptions and feelings. Attempts to help people to change might, unwittingly, be encouraging people to accept the *status quo* as good and maladaptation to it to be a form of personal failure. It may be as important to strive to change one's world as to understand it.

This notion of empowerment lies at the heart of the work of Mezirow (2000) and Brookfield (1995). They argue that when students are empowered, they learn better. Mezirow, in his complex theory of transformative learning, argues that the goal and process of learning are the development of critical reflection which transforms the learner's perspectives of the content of study, its methods and its underlying assumptions. In so doing, it changes the learners' views of reality. The phases that learners undergo are:

- initial empowerment through freedom to participate and personal decision-making
- critical self-reflection through consciousness-raising and by challenging assumptions
- transformation of learning through the revision of assumptions and actions supported by other learners and teachers
- increased empowerment that leads to further transformative learning.

Brookfield argues that critical reflection and thinking are core constituents of the learning process. Teachers and learners should together explore alternative views and values implicit in the subject of study and its cultural and historical antecedents. In so doing, it is argued, the students will become emancipated, independent learners.

The views of Brookfield and Mezirow are based primarily on arguments that may be derived from radical democratic principles. They see learning as a political process, as a way of helping learners to change their 'worlds' as well as understanding them. Their ideas may seem remote from the hurly burly of teaching large classes, but they serve as a powerful reminder that how students learn in all academic subjects is socially situated. The purpose of learning may not merely be to change the knowledge of students, but to change their

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perceptions of the subjects that they are studying, their perceptions of the world and, perhaps, to change it.

Implications for teaching and learning

Humanistic perspectives focus on the intellectual and emotional growth of students by giving students freedom to learn and responsibilities for their own learning. The role of the teacher is to facilitate and guide students to enable them to realise their potential. To achieve these humanistic goals, the methods of learning advocated are:

- enquiry-based approaches such as problem-based learning, projects and dissertations
- discussion methods that enable students to explore their conceptions and values
- reflective learning tasks such as portfolios and learning logs
- feedback that focuses on ways of developing understanding
- assessment methods that involve self, peer and collaboration and include reflection on experience.

There are difficult choices to be made about the degrees of freedom and responsibility to be given to students at different stages of a degree programme. As usual, the best policy lies in the middle ground.

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14 Summary

This guide has been concerned with the development of your understanding of how students learn and how one can help them to learn. It has addressed the questions ‘How do students learn?’ and ‘How do they learn best?’ by providing an overview of the major theories of learning that are relevant to course design, teaching, learning and assessment. The guide has not considered the developmental theories of Piaget (see Smith, Dockrell and Tomlinson, 1997), the work of Perry and Heath with undergraduates (see Brown, Bull and Pendlebury, 1997), the dynamics of learning in groups (see Jaques, 2000) the challenging views of situated learning theorists (Lave and Wenger,1999) or the perceptive writings of feminists such as Gilligan (1986) and Caffarella and Olson (1993). All of these, and many more, have their place in a deeper understanding of how students learn.

Choosing which theories of learning are best for understanding one’s own teaching and how one’s students learn are challenging and reflective tasks. In tackling those tasks, you might bear in mind the wise words of a distinguished nineteenth-century psychologist, William James:

> *Psychology is a science and teaching is an art: and sciences never generate arts directly out of themselves.*
>
> (James, 1891: 15)

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References

Atkins, M., Beattie, J. and Dockrell, B. (1993) *Assessment Issues in Higher Education* Sheffield: Employment Department.

Ausubel, D. (1978) *Educational Psychology: A cognitive view* New York: Holt Rinehart and Winston, 2nd edn.

Baddeley, A. D. (1999) *Essentials of Human Memory* Hove: Psychology Press.

Biggs, J. (1996) Enhancing teaching through constructive alignment *Higher Education* **32**: 347–64.

Biggs, J. (2003) *Teaching for Quality Learning at University* Maidenhead: Open University Press, 2nd edn.

Bloom. B. S. (1965) *A Taxonomy of Educational Objectives Handbook I : Cognitive Domain* New York: McKay, 2nd edn.

Boud, D. and Feletti, G. (1998) *The challenge of problem based learning* London: Kogan Page, 2nd edn.

Bowden, J. and Marton, F. (1998) *The University of Learning: Beyond quality and competence* London: Kogan Page.

Bransford, J. D. and Johnson, M. K. (1972) Contextual prerequisites for understanding *Journal of Verbal Learning and Verbal Behaviour* **11**: 717–26.

Brookfield, S. (1995) *Becoming a Critically Reflective Teacher* New York: Jossey-Bass.

Brown, G. (2001) *Aligning Assessment* York: Generic Learning and Teaching Subject Network.

Brown, G. and Manogue, M. (2001) Refreshing lecturing: a guide for lecturers *The Medical Teacher* **24**: 231–44.

Brown, G., Bull, J. and Pendlebury, M. (1997) *Assessing student learning in higher education* London: Routledge.

Bruner J. (1992) Another look at New Look *American Psychologist* **47**: 780–83.

Caffarella, R. and Olson, S. (1993) Psychosocial development of women *Adult Education Quarterly* **43**: 125–51.

Candy, P. C. (1991) *Self-direction for lifelong learning: A comprehensive guide to theory and practice* San Francisco: Jossey-Bass.

Carter, R. (1985) A taxonomy of objectives for professional education *Studies in Higher Education* **10**: 135–49.

Chin, P. (2004) *Making more use of C&IT in your teaching* London: Routledge.

Clarke, J. (2004) *One to one teaching–- supervising, mentoring and coaching* London: Routledge.

Cowan, J. (2000) *On Becoming an Innovative University Teacher* Buckingham: Open University Press, 2nd edn.

Cox, B. (1997) The re-discovery of the active learner in adaptive contexts: a developmental–historical analysis of transfer of training *Educational Psychologist* **32**: 41–55.

De Cecco, J. P. and Crawford, W. R. (1974) *The Psychology of Learning and Instruction* New York: Prentice Hall.

Dewey, J. (1933) *How we think: A restatement of the relation of reflective thinking to the educative process* London: Heath.

Dewey, J. (1997) *Experience & education* New York: First Touchstone Edition.

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Dochy, F., De Rijdt, C. and Dyck, W. (2003) Cognitive prerequisites of learning *Active Learning in Higher Education* **3**: 265–84.
Entwistle, N. (2000) *Styles of Learning and Teaching* London: Fulton Publishing.
Entwistle, N. and Tait, H. (1990) Approaches to learning: evaluation of teaching and preferences for contrasting academic environment *Higher Education* **19**: 169–94.
Exley, K. and Dennick, R. (2004a) *Small GroupTeaching – Tutorials, Seminars and beyond* London: RoutledgeFalmer.
Exley, K. and Dennick, R. (2004b) *Giving a Lecture – From presenting to teaching* London: RoutledgeFalmer.
Gagne, R. M. (1985) *The Conditions of Learning* New York: Holt, Rinehart and Winston, 4th edn.
Gagne, R. M., Briggs, L. and Wager, W. (1992) *Principles of Instructional Design* Florida: Harcourt Brace, 4th edn.
Gilligan, C. (1986) *In a Different Voice* Cambridge, Mass.: Harvard Educational Press.
Haines, C. (2004) *Assessing Students' Written Work* London: Routledge.
Hatton, N. and Smith, D. (1995) Reflection in teacher education: towards definition and implementation *Teaching and Teacher Education* **11**: 33–51.
Honey, P. and Mumford, A. (1986) *Using your Learning Styles* Maidenhead: Peter Honey, 2nd edn.
James, W. (1891) *Talks to Teachers on Psychology* Cambridge: Harvard University Press, 1983 edn.
Jaques, D. (2000) *Learning in Groups* London: Kogan Page, 3rd edn.
Jarvis, P., Holford, J. and Griffin, L. (2003) *The Theory and Practice of Learning* London: Kogan Page, 2nd edn.
Knowles, M. (1990) *The Adult Learner: A neglected species* Houston: Gulf, 4th edn.
Kolb, D. (1984) *Experiential Learning: Experience as a source of learning* Englewood Cliffs: Prentice Hall.
Laurillard, D. (1993) *Rethinking University Teaching* London: Routledge.
Laurillard, D. (1997) Styles and approaches in problem solving in F. Marton, D. Hounsell and N. Entwistle (eds) *The experience of learning: Implications for studying and teaching in higher education* Edinburgh: Scottish Academic Press.
Lave, J. and Wenger, E. (1999) Learning and pedagogy in communities of practice, in J. Leach and B. Moon (eds) *Learners and Pedagogy* London: Paul Chapman and Open University Press.
Maguire, E. A., Gadian D. G., Johnsrude, I.S. *et al*. (2000) Navigation-related structural change in the hippocampi of taxi drivers *P Natl Acad Sci USA* **97** (8): 4398–403, 11 April 2000.
Marton, F., Hounsell, D. and Entwistle, N. (eds) (1993) *The Experience of Learning: Implications for studying and teaching in higher education* Edinburgh: Scottish Academic Press.
Maslow, A. (1968) Some educational implications of humanistic psychologies *Harvard Education Review* **36**: 685–96.
Merriam, S. B. and Cafarella, R. S. (1999) *Learning in Adulthood* San Francisco; Jossey-Bass, 2nd edn.
Mezirow, J. (2000) *Learning as transformation; Critical perspectives on a Theory-in-Progress* New York: Jossey-Bass.

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Murray, D. (1996) *Gestalt Psychology and the Cognitive Revolution* Englewood Cliffs: Prentice Hall.
Otter, S. (1992) *Learning Outcomes in Higher Education* London: UDACE/HMSO.
Peyton, J. W. R. (1998) *Teaching and Learning in Medical Practice* Rickmansworth: Manticore Europe.
Prosser, M. and Trigwell, K. (1999) *Understanding Learning and Teaching* Buckingham: Open University Press.
Ramsden, P. (1992) *Learning to Teach in Higher Education* London: Routledge.
Resnick, L. B. and Nelson-Le Gall, S. (1997) Socialising intelligence, in L. Smith, J. Dockrell and P. Tomlinson (eds) *Piaget, Vygotsky and beyond: future issues for developmental psychology and education* London: Routledge.
Rogers, C. (1983) *Freedom toLlearn for the 1980s* Colombus: Merrill.
Schon, D. A. (1983) *The Reflective Practitioner* London: Temple Smith.
Schon. D. A. (1988) *Educating the Reflective Practitioner* San Francisco: Jossey-Bass.
Skinner, B. F. (1973) *Beyond Freedom and Dignity* Harmondsworth: Penguin Books.
Smith, I., Dockrell, B. and Tomlinson, P. (eds) (1997) *Piaget, Vygotsky and beyond: Future issues for developmental psychology and education* London: Routledge.
Steffe, L. and Gale, J. (eds) 1995 *Constructivism in Education* Hillsdale NJ: Erlbaum.
Stephenson, J. and Weil, S. (eds) (1992) *Quality in Learning* London: Kogan Page.
Stevens, R. (1990) Humanistic psychology, in I. Roth (ed.) *Introduction to Psychology* Hove: Lawrence Erlbaum.
Tennant, M. (1997) *Psychology and Adult Learning* London: Routledge.
Tough, A. (1983) Self-planned learning and major personal change, in M. Tight (ed.) *Adult Learning and Education* London: Croom Helm.
Wankat, P. C. and Oreovicz, F. S. (1993) *Teaching Engineering* New York: McGraw-Hill.
Watson, J. B. (1913) Psychology as the behaviourist views it *Psychological Review* **20**: 158.
Wertheimer, M. *(1968) Productive Thinking* London: Tavistock Publications.

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Further Reading

Chapters

There are useful chapters on learning in:

Brown, G., Bull, J. and Pendlebury, M. (1997) *Assessing Student Learning in Higher Education* London: Routledge.
Fry, H., Ketteridge, S. and Marshall, S. (2002) *A Handbook for Teaching and Learning in Higher Education* London: Kogan Page, 2nd edn.
Reece, I. and Walker, S. (2000) *Teaching, Training and Learning* Sunderland: Business Education Publishers, 4th edn. incorporating FENTO standards.
Rogers, A. (2002) *Teaching Adults* Maidenhead: Open University Press, 3rd edn.

None of the above cover all the theories discussed in this guide.

Books

Bigges, M. L. (1964) *Learning Theories for Teachers* New York: Harper and Row.
This is an old text that provides thoughtful comparisons of major theories of learning, particularly of Gestalt psychology and behaviourism.
Jarvis, P., Holford, J. and Griffin, L. (2003) *The Theory and Practice of Learning* London: Kogan Page, 2nd edn.
Provides a detailed survey of the major theories of learning.
Tennant, M. (1997) *Psychology and Adult Learning* London: Routledge.
Provides an insightful critique of many theories of learning of relevance to student and adult learning.

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