Chapter 2

The ideas of behaviourism have their roots in the late nineteenth and early twentieth centuries. John B. Watson, an American working in the realm of the new psychology, is widely accepted as one of the earliest proponents of behaviourism. He is believed to have first used the term 'behaviourism' (though he probably used an American spelling). Watson came to the view that psychology could only ever become a true science if it became a process of detailed objective observation and scientific measurement. This notion of observation and measurement became central to the work of behaviourists. Any consideration of mental process, which is by definition unobservable, fell outside of their self-imposed range of interest. So behaviourist approaches to, and explanations of, learning developed out of the study of what can actually be seen. As we will see, this approach to developing a psychological theory of learning ignores much of the hidden mental process which later workers in the field have come to explain and to hold as crucially important to our understanding of the complex activity that makes up different types of learning.

Behaviourism is based around the central notion of a reaction being made to a particular stimulus. This apparently simple relationship has been used to describe even the most complex learning situations. At its simplest, we can observe behaviour, which we can refer to as 'learnt behaviour', in a wide range of diverse situations. For example, a performing seal will respond to a particular stimulus — the sound of a hooter or the presentation of a fish — by raising itself up and slapping its flippers together as if clapping. A pet dog will respond to the stimulus of the spoken word, 'Beg', by doing just that, much to the delight of onlookers.

This stimulus-response relationship can also be seen in humans. In situations where an immediate response is required, practice situations are repeated endlessly so that the soldier, firefighter or airline pilot will make the correct, possibly life-saving response in a given situation. The importance of responsive practice has been underlined in more recent years and explained in terms of the reinforcement of particular neural pathways in the brain, which has the effect of faster and smoother implementation of certain actions and responses. The adage 'practice makes perfect' seems to hold good for behaviourists and neuropsychologists alike. In schools we notice an obvious response to the signal marking the end of a lesson. No matter how many times the teacher might remind a class that the bell is a signal for the teacher, the class can hardly restrain themselves from collecting their pens and pencils together ready to leave. Also in the classroom, a child might respond to the stimulus of the question, 'What are seven eights?' with the automatic response, '56'. This immediate 'correct' response will be made if the connection between the stimulus and response has been built correctly in the first instance, and subsequently reinforced over time; the associated neural pathways have been practised and strengthened. It should be noted here that making a 'correct' response does not necessarily imply understanding. In the same way as a parrot might react to the question, 'How are you?' with the response, 'I'm fine', so a child correctly responding with '56' need not necessarily understand the significance of the reply. Behaviourism is based upon the simple notion of a relationship between a stimulus and a response, which is why behaviourist theories are often referred to as 'stimulus-response' (SR) theories.

Behaviourism: a definition

Behaviourism is a theory of learning focusing on observable behaviours and discounting any mental activity. Learning is defined simply as the acquisition of new behaviour.

Behaviourists call this method of learning 'conditioning'. Two different types of conditioning are described and demonstrated as viable explanations of the way in which animals and humans alike can be 'taught' to do certain things. First there is classical conditioning.
**Classical conditioning**

This involves the reinforcement of a natural reflex or some other behaviour which occurs as a response to a particular stimulus. A well-known example of this type of conditioning, the first of its kind, is the work of Ivan Pavlov, a Russian physiologist at the start of the twentieth century, who conditioned dogs to salivate at the sound of a bell. He noticed that dogs salivated when they ate, or even saw, food. In his initial experiments he sounded a bell at the time when food was presented to the dogs. The sound of the bell became, for the dogs, an indication that food was about to be presented and eventually the dogs would salivate at the sound of the bell irrespective of the presence of food. The dogs had been conditioned to respond to the sound of the bell by producing saliva. Their behaviour had been successfully modified.

We talk about conditioning and conditioned responses in a general way. Feelings of fear at the sound of the dentist’s drill or at the sight of a syringe in preparation for an injection are examples of conditioned responses.

Pavlov identified four stages in the process of his classical conditioning and what follows from the initial connection between stimulus and response: acquisition, extinction, generalisation and discrimination.

**Acquisition**

The *acquisition* phase is the initial learning of the conditioned response – for example, the dog salivating at the sound of the bell.

**Extinction**

Once learnt, a conditioned response will not remain indefinitely. *Extinction* is used to describe the disappearance of the conditioned response brought about by repeatedly presenting the bell, for example, without then presenting food.

**Generalisation**

After a conditioned response to one stimulus has been learnt, it may also respond to similar stimuli without further training. If a child is bitten by a dog, the child may fear not only that particular dog, but all dogs.

**Discrimination**

*Discrimination* is the opposite of generalisation. An individual learns to produce a conditioned response to one stimulus but not to another similar stimulus. For example, a child may show a fear response to freely roaming dogs, but may show no fear when a dog is on a lead; or distrust Alsatians but not Jack Russell terriers.

**Operant conditioning**

The second type of conditioning is ‘operant conditioning’. Operant conditioning is the most important type of behaviourist learning. It is more flexible in its nature than classical conditioning and therefore seen as potentially more powerful. It involves reinforcing a behaviour by rewarding it. It can also work in a negative way, when an undesirable behaviour can be discouraged, by following it with punishment of some form. In some cases, simply not offering an expected reward for a particular behaviour is a sufficient punishment. For example, if a mother gives her child a chocolate bar every day that he tidies his bedroom, before long the child may spend some time each day tidying. In this example, the tidying behaviour increases because it is rewarded. This rewarding is known as ‘reinforcement’. It is likely that the tidying behaviour would decrease or stop completely if the rewards were suspended.

Skinner, a psychologist working in America in the 1930s, is the most famous psychologist in the field of operant conditioning and probably the most famous behaviourist. Skinner studied the behaviour of rats and pigeons, and made generalisations of his discoveries to humans. He used a device now called a Skinner box. The Skinner box was a simple, empty box in which an animal could earn food by making simple responses, such as pressing a lever. A normal, almost random action by the animal, such as pressing a lever in the box, would result in a reward, such as a pellet of food. As the rewards continued for the repetition of the action, the animal ‘learnt’ that in order to be fed it must press the lever.

Skinner maintained that rewards and punishments control the majority of human behaviours, and that the principles of operant conditioning can explain all human learning. The key aspects of operant conditioning are as follows.
Reinforcement

This refers to anything that has the effect of strengthening a particular behaviour and makes it likely that the behaviour will happen again. There are two types of reinforcement: positive and negative.

Positive reinforcement

Positive reinforcement is a powerful method for controlling the behaviour of both animals and people. For people, positive reinforcers include basic items such as food, drink, approval or even something as apparently simple as attention. In the context of classrooms, praise, house points or the freedom to choose an activity are all used in different contexts as rewards for desirable behaviour.

Negative reinforcement

As its name suggests, this is a method of decreasing the likelihood of a behaviour by pairing it with an unpleasant ‘follow-up’. There is controversy about whether punishment is an effective way of reducing or eliminating unwanted behaviours. Laboratory experiments have shown that punishment can be an effective method for reducing particular behaviour, but there are clear disadvantages, especially in classroom situations. Anger, frustration or aggression may follow punishment, or there may be other negative emotional responses.

Shaping

The notion of shaping refers to a technique of reinforcement that is used to teach animals or humans behaviours that they have never performed before. When shaping, the trainer begins by reinforcing a simple response which the learner can easily perform. Gradually more and more complex responses are required for the same reward. For example, to teach a rat to press an overhead lever, the trainer can first reward any upward head movement, then an upward movement of at least three centimetres, then six and so on, until the lever is reached. Shaping has been used to teach children with severe mental difficulties to speak by first rewarding any sounds they make and then gradually only rewarding sounds that approximate to the words being taught. Animal trainers use shaping to teach animals. In classrooms, shaping can be used to teach progressively complex skills, and more obviously to ensure the desired behaviour from children at such times as the end of the day, lining up for assembly and so on. When a teacher says something like, ‘Let’s see which table is ready’, it would not be unusual in many classrooms to witness many if not all of the children sitting up straight with folded arms, having tidied away their belongings.

There is a place for learning in classrooms that relies on the principles of behaviourism. However, since behaviourism gives little importance to mental activity, concept formation or understanding, there are difficult problems to overcome when setting out philosophies of teaching and learning that depend wholly upon behaviourist approaches.

Behaviourism in general learning situations

As all parents will understand, there are certain situations where, for reasons of safety, it is important that young children do not do certain things — stepping off the kerb, poking electrical sockets, reaching towards a pan of cooking vegetables and so on. In a potentially dangerous situation, a parent is likely to respond swiftly and decisively. Often the action taken by a parent will involve a shouted ‘No!’ or the rapid removal of the child from the situation. The child will come to associate the poking of an electrical socket with an undesirable reaction from the parent and in this way learn to avoid the reaction by not poking sockets — at least, that is the expectation. The reason for no longer carrying out socket-poking is not dependent upon an understanding of the dangers of electrocution. The cessation of the poking behaviour can be described in terms of negative reinforcement. Had the parental response to the action been a smile and a hug, it is possible that the action would be positively reinforced and the chances of repetition increased significantly. This is not to recommend shouting, smacking or any such extreme action, but it can be seen that for reasons of expediency and future safety, a behaviourist response serves well.

Indeed, attempting to explain the nature of possible outcomes from particular actions becomes very difficult when such concepts as severe injury or
death come into the equation. The eradication of the behaviour is the most important consideration; the concepts involved become far less important. Some might argue that knowing to do or not to do something is, initially at least, far more important than understanding; the understanding can follow along behind at a more appropriate time in the intellectual development of the child.

**Behaviourism in ‘school learning’**

To apply models of behaviourism in the classroom, it is necessary to have clear ideas of the behaviours (operants) to be encouraged and reinforced. These behaviours could be either related to general behaviour (in the ‘good/bad behaviour’ sense of the word), or more educational content-related – spellings, tables and so on. The nature of the reinforcement also needs to be established. Rewards can be widely variable in nature – ticks and written comments in books; stars, stamps and stickers; more formal points or commendations possibly leading to higher level rewards such as certificates; verbal and public praise; extra privileges; sweets.

**Considerations for the use of rewards**

- The rewards need to have value to the children.
- If rewards come unexpectedly, intrinsic motivation will remain high.
- If extrinsic rewards are used, it is important that everyone receives one for their best efforts. Rewarding only the ‘best’ is not a satisfactory approach, as it is vital to maintain high self-esteem, especially with the less able and lower attaining children.
- Rewards can be used to invigorate or add fun to an activity.

**Problems in using extrinsic rewards**

- Rewards can belittle or demean a learning experience.
- Rewards can engender feelings of unfairness or competition.
- Rewards can detract from the real issue involved in completing tasks.
- Rewards do not always lead to higher quality work.
- Rewards may isolate children who feel they have little chance of getting a reward.

Critics of the application of behaviourist approaches make two main points. First that rewarding children for all learning is likely to cause the child to lose interest in learning for its own sake. Studies have suggested that using rewards with children who are already well motivated may lead to a loss of interest in the subject. Second, using a reward system or giving one child increased attention may have a detrimental effect on the others in the class. Using a behaviourist approach in the classroom seems to be most effective when applied in cases where a particular child has a history of academic failure; where there is very low motivation and high anxiety; and in cases where no other approach has worked.

Teachers find, and research (for example, Elliot & Busse 1991) also indicates, that rewarding aids the reinforcement of appropriate classroom behaviours, such as paying attention and treating others well; decreases misbehaviour; and makes for a more orderly atmosphere which is conducive to learning. The creation and maintaining of a supportive atmosphere conducive to work and attainment is a prerequisite for effective teaching. The standards that apply to the award of QTS in the United Kingdom require that trainee teachers demonstrate that they are able to: ‘promote positive values’ (Standard S1.3) and ‘establish a purposeful working environment’ (Standard S3.3.1) (TTA 2003). Subtle behaviourist approaches can be a useful tool for teachers in this area of their role.

Since it seems to be the case that the more often a stimulus and response occur in association with each other, the stronger the habit will become, a concentration on repetition seems to be a reasonable approach to take in certain learning situations. This repetition is seen in the drill and practice tutorials often associated with the learning of basic skills. An example of behaviourism taking on a major role in a drill and practice situation came with the onset of the introduction of computers into classrooms. With ‘drill and practice’ software, children are routinely presented with several answers to a question and with each correct response they receive some type of positive reinforcement (a smiley face, more fuel or more bullets to fire). With each incorrect response, children are, at best, given the opportunity to
review the material before attempting to answer the question once again or, at worst, given the equivalent of a punishment in the form of a non-smiley face, the loss of points or some such undesirable outcome. These types of programs allow children of varying abilities to work on exercises in their own time and at their own pace. In this way, it is said, all can achieve a similar level of competence and teacher time can be spent on teaching more complex knowledge and skills or focusing on those with particular needs. It has to be said that many children do find this style of presentation of work motivating and for some the learning benefits, in terms of test scores, for example, are clear. There are, as we have seen, questions concerning understanding and conceptual development. The use of individualised, behaviourist learning, mediated by computers, in the form of an Integrated Learning System (ILS), has become a feature of some developments in ICT-supported learning environments, as we will see later.

Skinner urged educators to focus on reinforcement and on success rather than on punishing failure. In many cases, those who benefit most from approaches based on behaviourist notions are those who are less well motivated, have high anxiety or a history of failure. It must be remembered that these techniques do not work well for everyone. Bright children can find programmed instruction or simplistic drill and practice situations unsatisfying and even boring. Some children crave understanding and find answers without understanding difficult and frustrating.

The idea of learning without understanding, mentioned briefly above, has at times been transported directly into the classroom. Some readers may well remember being told how to divide one vulgar fraction by another by turning one of the fractions ‘upside down’ and then multiplying them together. This approach to teaching and being able to achieve right answers is fine for some, but for others it seems like some sort of voodoo spell and can lead to a high level of frustration. Some need to know why certain apparent ‘tricks’ work; without understanding the logic, they cannot operate. This was summed up by the maths educator Arnold Howell when he quoted a not uncommon rhyme used to help remember the trick for dividing one fraction by another: ‘Ours is not to reason why, just invert and multiply.’

Behaviourism, then, is based on the idea that learning is a change in behaviour and that changes in behaviour occur as a response to a stimulus of one kind or another. The response leads to a consequence, and when the consequence is pleasant and positive then the behaviour change is reinforced. With consistent reinforcement, the behaviour pattern becomes conditioned.

An example might involve teaching a child to say ‘please’ and ‘thank you’ appropriately. If the child is hungry and sitting at the table, the parent might have the child say, ‘please’ when offered food and ‘thank you’ when it is taken. If ‘please’ is not given, the food is withheld. When ‘please’ is finally given up by the child, the food is served. Over the course of many meals, the child’s response to the stimulus becomes conditioned and a life-long pattern of saying ‘please’ and ‘thank you’ at suitable times becomes established.

Many modern learning theorists and educationalists discount a great deal of behaviourist theory. However, there are situations where a behaviourist approach is likely to work well. Programmed learning was developed out of the theories of Skinner and others, and became a fashionable and partly successful approach to teaching in the middle part of the last century. Skinner (1958) described the purpose of programmed learning as being to ‘manage human learning under controlled conditions’. In practice, this would mean that a textbook or, as the technology allowed, a computer presents material to be learnt in a series of small steps, each step known as a ‘frame’. Each frame would contain an item of information and a statement with a blank space to be completed by the learner. The correct answer would next be uncovered by moving a paper down the page, or by some such process, before the learner would move on to the next frame. Each frame would introduce a new idea or review what had gone before. The learner’s response, compared with the uncovered answer, serves to reinforce correct responses, making it likely that they will be repeated and internalised. The process of shaping is employed, in that the programme of learning starts from the learner’s initial knowledge then moves forwards in small increments. The learner is usually, as a result of the progression being made in very small steps, able to give accurate and correct responses which are continually positively reinforced, which will have the effect of keeping motivation high. Skinner emphasised the reinforcement given by the ‘machine’ for every correct response, and the importance of immediate feedback.
Behaviourism is clearly at the heart of, and the key to the success of, programmed learning. In more recent times, ILSs have made use of the behaviourist tradition and the processing power of modern computers to provide individualised routes through learning materials. An ILS is a computer-based system used for teaching. Lessons are organised by level of difficulty and worked through progressively by an individual learner. An ILS also includes a number of management tools for assessment, record keeping, report writing, and for providing other user information files which help to identify learning needs, monitor progress and maintain records.

By repeatedly presenting information in small amounts and by reinforcing correct responses, the ILS is operating in a way that can be traced back directly to Skinner’s ideas. Becker (1993) identifies the behaviourist ‘programmed learning’ theories of Skinner and others as those which underpin the model of learning used by Integrated Learning Systems. These theories assume the child’s learning is solitary and individualistic. Purcell (undated) points out that ‘behaviourist ideas of learning certainly match the style of teaching and learning associated with the use of Integrated Learning Systems’.

The behaviourist approach which seems to be at the heart of ILSs has been a cause of concern for many; the apparent lack of understanding that is engendered by the process is also cause for concern. However, certain elements of the results in standardised tests in both literacy and numeracy have shown marked increases in many cases where ILSs have been evaluated (Underwood & Brown 1997; Underwood et al. 1994).

In the early days of computer use in schools, there were many examples of educational software designed wholly around behaviourist principles, as we saw earlier. Challenges would be set in spelling or in arithmetic, and a correct answer would activate a jingle and a flashing picture to indicate success. An incorrect answer would result at best in nothing, but at worst in a condemnation in the form of a screen picture of maybe a dunce’s cap accompanied by an appropriate sound effect. The simplicity of many of the programs led to an approach of trial and error, or even random selection by some users, and the use of this type of program was condemned by some. For example, Daniel Chandler (1984) considered that ‘The microcomputer is a tool of awesome potency which is making it possible for educational practice to take a giant step backwards.’ Others have seen the benefits to particular individuals and groups of children. This is perhaps an indication that the adoption of a blanket, one-size-fits-all approach is not appropriate when we are considering the learning experiences we provide for children.

**Behaviourism in practice**

In addition to using behaviourist methods in certain teaching situations, the methods can also be effective in establishing classroom behaviours. In a classroom environment, the teacher identifies the behaviours that are desirable and the behaviours that would be best discouraged. It is a somewhat natural impulse to develop punishments for those behaviours that need to be discouraged, yet research has indicated that positive reinforcements have a stronger and longer-lasting effect. Therefore, instead of devising a punishment for undesired behaviour, a reward of some kind for the preferred behaviour should be devised. When the correct actions are taken – sitting quietly, not shouting out, forming an orderly line by the door – the child is rewarded. When the incorrect action shows up, the reward is withheld. The most important element in establishing rewards is that they must be relevant to the child and be equally available to everyone in the classroom. Another consideration is that the reward can be incredibly simple. For many young children, the approval of the teacher or some public display of simple praise is reward enough. In some classrooms, more regulated systems of reward work well. We have already considered the use of a system of points leading to stars on a chart, with the possibility of an end-of-term treat or the awarding of a smiley-faced sticker serving well. Teachers often devise their own schemes for reward and some include the option to remove the reward, by deducting a point or removing the privilege in some way. The importance of a positive stance towards behaviour management is the crucial element of behaviourist 'control' and this seems to be emphasised by effective teachers. The influential McBer Report (DfEE 2000) tells us that an effective teacher 'uses rewards to influence behaviour and performance positively'.

Self-paced learning modules can be designed to take advantage of behaviourist principles. A learning experience that gives frequent feedback while the child 'learns' the material in small, bite-sized pieces is much more likely
to be successful than a learning experience that simply consists of extensive reading with an end-of-term test as the only form of assessment. To further increase the likelihood of success, content can be arranged in such a manner as to 'steer' the child towards correct responses. Early success is likely to increase a child's self-esteem and add to the child's motivation to carry on. While some may find this method to be overly helpful or think of it as too much hand-holding, the end result is that the child has accomplished the goal and been able to meet specific learning objectives as planned. It is certainly the case that if behaviourist approaches were to be totally disregarded in planning for learning, a certain measure of what has been shown to be effective would be lost. However, as we will consider in later chapters, there are other theoretical perspectives that, in all probability, have more importance to the majority of learning situations, which teachers will be keen to establish. Behaviourism has a place in planning that teachers undertake, but it should most certainly not be relied upon alone as a perspective from which to plan all teaching and learning.

A history of the names associated with behaviourism

Pavlov

Pavlov developed the theory known now as 'classical conditioning' through the study of dogs. From his perspective, learning begins with a stimulus-response connection. In this theory, a certain stimulus leads to a particular response.

Thorndike

Thorndike introduced a theory of learning now called 'connectionism'. Thorndike emphasised the role of experience in the strengthening and weakening of stimulus-response connections: 'Responses to a situation that are followed by satisfaction are strengthened; responses that are followed by discomfort weakened.' Thorndike proposed that practice also influences stimulus-response connections. His idea that rewards promote learning continues to be a key element of behaviourist theory.

Watson

Watson introduced the term 'behaviourism' and was an important advocate of the approach in the early part of the twentieth century. Watson called for the use of scientific objectivity and experiment in the psychology of learning. He devised the law of frequency that stressed the importance of repetition: 'The more frequent a stimulus and response occur in association with each other, the stronger that habit will become.' He also devised the law of recency: 'The response that has most recently occurred after a particular stimulus is the response most likely to be associated with that stimulus.'

Guthrie

Edwin Guthrie put forward a theory of what he called 'contiguity': 'A stimulus that is followed by a particular response will, upon its recurrence, tend to be followed by the same response again. This stimulus-response connection gains in its full strength on one trial.' Guthrie conducted very little practical research and as a result doubt has been cast upon his theories.

Skinner

Skinner is probably the best known psychologist in the behaviourist tradition. He identified the theory of operant conditioning. Skinner spoke only about the strengthening of responses, not the strengthening of habits or actions. Skinner used the term 'reinforcer' instead of 'reward'. He was keen to stress the importance of a positive approach to learning involving rewards, but also understood the value of punishment. His most fundamental principle is his law of conditioning: 'A response followed by a reinforcing stimulus is strengthened and therefore more likely to occur again.' A second principle was his law of extinction: 'A response that is not followed by a reinforcing stimulus is weakened and therefore less likely to occur again.' Skinner's work was meticulous and methodical, based upon scrupulous scientific observation and measurement. He developed strict schedules of reinforcement in his attempt to codify learning and to establish a pattern of best practice. In his later work, he began to recognise the
influence of mental process which had previously been acknowledged by behaviourists.

**Summary**

Behaviourists see learning as a relatively permanent, observable change in behaviour as a result of experience. This change is effected through a process of reward and reinforcement but has little regard, initially, for mental process or understanding.

**In the classroom**

- Standard routines and expectations for behaviour can be made clear and reinforced in a behaviouristic way.
- The use of rewards in the form of team points, or such like, can be a great incentive to work hard and to behave well.
- Punishments, such as loss of privileges, or the withholding of rewards can be effective as well, although it is widely recognised that a positive approach is preferable to an approach to behaviour management predicated solely on punishments.
- Some 'rote' learning may be a useful way of helping some children to cope better with some of the aspects of their work which they find difficult. Where possible, initial rote learning should be followed by attempts to encourage understanding.

It is interesting, in consideration of the basic tenets of behaviourist learning theory, to look briefly at a quotation from Lao-Tzu, an ancient Chinese philosopher of the sixth century: 'Rewards and punishments are the lowest form of education.'

This leads conveniently into the next chapter which deals with cognitive learning theory, where the place of reward and punishment is far less prominent.

**Chapter 5**

**Constructivist theories**

The area of constructivism, in the field of learning, comes under the broad heading of cognitive science. Cognitive science is an expansive area. It has its roots in the first half of the twentieth century at a time when academics from the disciplines of psychology, artificial intelligence, philosophy, linguistics, neuroscience and anthropology realised that they were all trying to solve problems concerning the mind and the brain.

**Cognitive science: a definition**

Cognitive scientists study (among other things) how people learn, remember and interact, often with a strong emphasis on mental processes and often with an emphasis on modern technologies. Cognitive science investigates 'intelligence and intelligent systems, with particular reference to intelligent behaviour' (Posner 1984).

**Cognitive psychology: a definition**

Cognitive psychology is the scientific study of mental processes such as learning, perceiving, remembering, using language, reasoning and solving problems.

**Constructivism: a definition**

Constructivists view learning as the result of mental construction. That is, learning takes place when new information is built into and added onto an