
CENTRE FOR ACADEMIC PRACTICE

C*f*AP

04 LEARNING SKILLS

L4 EFFECTIVE LEARNING

The brain

If we are to learn effectively, it's necessary to understand a little bit about how our brains work.

Our brain can be thought of as an enormously powerful muscle with great potential for development. It is now known that we have two sides to our upper brain that are linked by a complex network of nerve fibres. The left side of the brain deals with logic, language, reasoning, number, linearity, and analysis, the so-called 'academic activities'. These you might think are the most important thinking processes for engineering. But what about the right side, the creative side of your brain? It deals with rhythm, music, images, imagination, colour, parallel processing, daydreaming, face recognition and pattern or map recognition. This is the side that is essential for dreaming up hypotheses, experiments, creating designs. A lot of attention has been paid recently to matching learning methods to the right hand side of the brain. Using patterned notes, diagrams, colour, imagination, humour, when using memory techniques or preparing notes are related to the right side of the brain. Further information about this can be found in the packs on Note-Making and Thinking Skills. Previously, education mainly concentrated on developing the left hand side, particularly in the sciences. What is now known is that development of the weaker side brings an improvement in all areas of mental performance. So be as creative as you can when you approach your learning.

In your brain there are a minimum of 10,000,000,000 individual neurons or nerve cells and these can interact with each other in many ways. It is estimated that the brain is capable of making 10800 interconnections and patterns using the 10,000,000,000, neurons. So you have a phenomenal resource at your disposal and are the possessor of the most powerful and sophisticated machine on earth.

Everyone has enormous spare mental capacity. We only use the smallest fraction of our mental potential. Getting started is often difficult, but once we do, the brain works with awesome speed.

So, it's important for you to note that the brain works in interconnection and patterns. This is very important to remember especially with regard to memory and understanding. It is also important to remember, that like any other part of your body, it improves with exercise, but it also tires.

Kinds of learning

Think about the way you have learned things since you were born. For example:

- to speak a language;
- to walk;
- to feed yourself;
- to list the capital cities of Europe;
- to change a plug;
- to drive;
- why plants grow;
- why trees drop their leaves in winter;
- people's names;

You learned the names of people and capital cities by Memorising them.

You learned why trees drop their leaves and plants grow by Understanding.

You learned to speak, walk, and feed yourself by Doing.

The methods may overlap but it is important to think of learning in terms of:

- Learning in order to Memorise something.
- Learning in order to Understand something.
- Learning in order to Do something.

Example 1

On the next page there are three headings. Put the following items of learning under the appropriate heading in terms of whether they are learned by Memorising, Understanding, or Doing. Some of them overlap, in which case you can put them in more than one column:

playing football	telephone numbers	predict the weather
what causes an earthquake	the alphabet	poems
swimming	tie shoelaces	horse riding
dates in history	how we digest our food	why people get fat
cycling	why we have laws	multiplication tables
diving	fractions	why Australians don't fall off the earth running
typing	how a battery works	names of flowers
traffic routes	your national insurance number	
skiing	verbs in a foreign language	
how to repair a carburettor	how to make a buttonhole	

Memorising	Understanding	Doing

Response

Have a look at how these were probably learned:

Memorising

telephone numbers
the alphabet
poems
dates in history
multiplication tables
names of flowers
your national insurance
number
traffic routes
verbs in a foreign a
language

Understanding

predict the weather
what causes an earthquake
poems
how we digest our food
why people get fat
why we have laws
fractions
why Australians don't fall
off the earth
how a battery works
how to repair a carburettor
how to make a buttonhole

Doing

playing football
swimming
tie shoe laces
horse riding
cycling
running
diving
typing
skiing

Memory

One of the most common anxieties of students is that they haven't got a good memory - that theirs is inferior to other people's. The good news is that this is a fallacy. Memory is not a sort of gift that we are born with nor is it thought to be linked to intelligence. Recent research suggests that memory has to do with recalling things you are certain of whereas intelligence directs itself to things that you are uncertain of or do not know about.

Memory starts at birth and gives shape and meaning to our lives. At every moment you are taking in information through your senses and continually processing it. Without it you would have to respond to every feeling, sight and sound as if you had never met it before. The world would have no meaning. Every little thing you perform rests upon your ability to draw upon information stored as a result of previous experience. Just think for a moment what it would be like to be isolated from all earlier experiences in the way that some amnesiacs are. So it's worth thinking for a moment about the amount of information stored in your brain and you will be aware of the richness and power of your memory.

Memory is a skill. Like any other skill it depends upon paying attention to it, practice, and training. If you feel that your memory is not very good, you can train it and improve its efficiency.

There are 3 ways by which taking a more positive attitude towards your memory can help you as a student:

1. Believe in it! On the whole we accomplish things which we believe we can do - we create what is called a self-fulfilling prophecy. If we believe something, our behaviour tends to reflect it.
2. Don't worry about your memory or you will be anxious and tense. Tension and stress work against your ability to remember.
3. When you believe in your memory, you are more likely to look for ways of developing and using it. So think positively about it.

Psychologists think it works in the following way:

There are 3 phases of memory, sometimes referred to as the 3 R's of memory- Reception, Retention and Recall.

1. Reception

This is the learning stage where information is taken in through our senses. Much of what we feel, see, smell or hear we ignore. What goes into our conscious awareness depends upon what we pay attention to long enough. Think for a moment about the different accounts people will give of a street accident. They rarely agree as they will have focused their attention on different things. Similarly, when meeting new people, one might feel nervous and shy and might not focus clearly on the faces and the names and then find that you cannot remember them and in future you might not try to.

So the first stage of memory has to do with selecting what you want to remember and paying attention to it.

This is not always easy if one is distracted either by things around one or problems and worries within.

Personal problems and domestic worries, anxieties about one's abilities and progress can all cause interference with your learning. One often has to consciously clear them away, to plan a time for dealing with them and then to put them aside. Similarly, with external distraction such as noise. Try to find another place to work, but if it's unavoidable, try to do something that requires less. Concentration, such as organising and summarising notes.

2. Retention

It is retention that involves the storage of information and is traditionally referred to as memory. There are 2 storage systems - the Short Term Memory (STM) and the Long Term Memory (LTM).

a) The Short Term Memory

It is thought that the information we take in is first stored in the Short Term Memory (STM). It has a high forgetting rate and limited storage. An example of something stored in the STM would be a telephone number you looked up and which would be forgotten shortly after use.

Example 2

Read the following numbers once and then cover them and immediately write them down from memory.

8 6 2 5 1 7

Now do the same with:

8 6 9 5 2 8 4 1 3 7

Response

You probably found the first one much easier than the second. The first number is within the capacity of the average STM which is thought to be about 6 or 7 items. The second was well beyond the STM storage capacity.

So the trick is to try and group items to keep them within this capacity. So they would now look like this:

86 95 28 41 37

Example 3

Now read the following words, then cover them and try to write them down.

saw	doctor	cat	lecturer	hamster
canary	miner	gerbil	hammer	screwdriver
postman	chisel			

Response

Did you try to group these things in order to remember them?

Would groups like those below have helped?

jobs	pets	tools
doctor	cat	saw
lecturer	hamster	hammer
miner	gerbil	screwdriver
postman	canary	chisel

You would only have had 3 categories to remember and then you'd just have to reconstruct the items in them. This is called 'chunking' and can be very useful when trying to remember a number of things - to reduce the number by grouping similar things together and extending the storage power of your STM. So whenever possible:

TRY TO SEE THE LINKS OR CONNECTIONS BETWEEN THINGS AND GROUP THEM TOGETHER TO REDUCE THE MEMORY LOAD.

Another way to try to lodge things in your STM is by repetition. This is a common way of learning times tables, remembering telephone numbers and so on. But it is time consuming and fairly boring.

b) Long Term Memory (LTM)

The LTM is thought to have unlimited capacity and an awesome ability to absorb and permanently retain information. Therefore the aim of Study Skills is to help students shift as much information as possible from the STM to the LTM. But information stored in the LTM could suffer from similar problems to anything stored for a long time in a loft. It could suffer from deterioration and be difficult to find and retrieve. Having it there is no use if it's not possible to find it, or when it's found, it's unusable.

3. Recall

This is not the same as recognition. It is not the same as reading over your notes and deciding you know it. It's the ability to bring out of your memory information in response to questions. This is what often worries students most. It is not much use to have retained information if you can't recall it when you need it. The way you have learned the material will be the key to your ability to recall it.

Learning

A useful way of looking at learning is to consider two kinds of levels of learning - surface learning and learning by understanding/deeper learning:

Surface learning

Rote or surface learning has to do with memorising items. This is not recommended as your main approach to learning but there are times when it's necessary to learn something by heart. If you needed to know the parts of a lathe, these might be committed to memory.

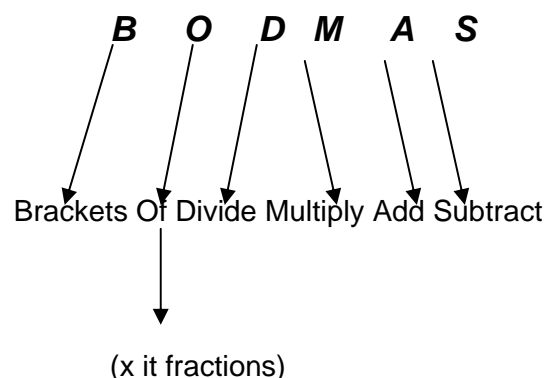
There are a number of techniques for helping commit things to memory and they are more useful than simple repetition.

a) Mnemonics

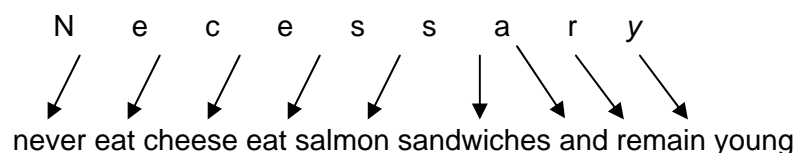
This is where you take the first letter of each key word and use them to form a simple word or as the first letters of words in a sentence.

Have a look at these:

Maths - the order of operations for algebra

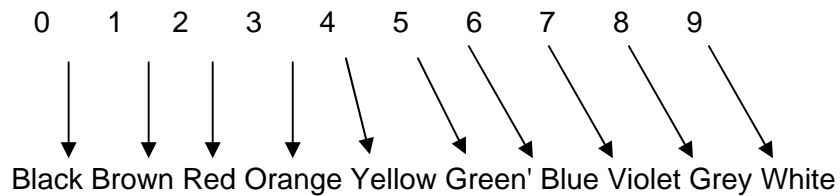


Spelling - the word 'necessary' often confuses - (difficult to remember how many of what).



Example 4

See if you can make a mnemonic to help you remember a resistor colour code. If you can make it funny, sexy or just plain silly it will be better. The mind is attracted to the unusual.

**Response**

Here is one that was used by some engineers:

Billy Briggs ran over your garden but Violet Grey wouldn't

Be careful when you're making mnemonics to differentiate between 2 letters if they are the same. Note the Br of Briggs which signals that that colour is brown and the use of grey to differentiate it from green.

b) Rhymes and Sayings

Many of us would be quite stuck without the useful rhyme 'Thirty days hath September...'

Magnetism - To remember Fleming's right/left hand rule for dynamos/motors:

'Motors travel on the left hand side of the road.'

These techniques can be fun and useful. However, only a small amount of our learning will lend itself to these techniques. Learning by understanding is far more valuable and is the kind of learning required for higher education.

Learning by understanding/ deeper learning

The importance of understanding in learning cannot be over-emphasised. Techniques for memorising, can be useful for unrelated items.

But you will stand a better chance of remembering something if you understand it. The more meaningful the material is to you, the easier it is to remember.

Example 5

Have a look at these numbers for a couple of minutes and then cover them and see if you can write them down.

2, 5, 10, 17, 26, 37, 50, 65, 82, 101

Response

How did you get on? Did you try to learn them by repeating them over and over again, or by visualising them? Did you succeed? Would you be able to write them down correctly this time next week?

There is an underlying pattern that links them. They are the numbers from 1 to 10 times themselves plus 1. Another way of looking at it is that the gaps between them are the odd numbers from 3 - 19 inclusive. It is easier to remember the sequence if you understand the principle that connects them. Patterns help you to remember.

NEVER TRY TO MEMORISE WHAT YOU DON'T UNDERSTAND.

Aids to Understanding:

1. Look for underlying principles, 'associative links' as the psychologists call them.
2. Link new information to information already learned. Just thinking about how the new information relates to what you already know aids remembering.
3. Look for examples of and applications for new information. Again you are actively working on the information to help you remember it.
4. Organise the information in the best way for you to learn it. This *may* involve making drawings, diagrams or colourful patterned notes. Your memory is like a filing system. It is easier to retrieve the information if it has been stored in an orderly way. You must try to organise it in a way that is meaningful for you, not just in the way that it is presented in books or notes.
Working on the material is very important. It means that you are actively learning rather than passively reading and rereading.

5. Be selective. Don't try to remember it all.
6. Your ability to remember will be closely linked to how interested you are in the information. Try to create interest by keeping an eye and an ear out for further information on it. Magazines, T.V. and radio can often provide further interest, as can discussion with others.
7. Try to break your learning up into manageable chunks. You will get satisfaction from achieving each bit but remember to keep relating the bits to what you already know.
8. Look for examples and relate it whenever you can to your own experience. An example of the pull of gravity might be the water system in your house.
9. Your ability to remember will rest upon how much you want to remember it, how hard you focus on it and how often you do this. Once or twice will not be enough.