Learning to Train

M.B. Heising 2023

Introduction

This article is about memory, how it is organised and how it is encoded. It is aimed at persons involved in training, that wishes to improve their effect as trainers.



There are many models showing the functioning of the human mind, and scholars all agree that when it comes to how the brain works, non of them have an exhaustive description.

This lecture is about learning, which is the act of being able to recall a piece of information from memory.

Regarding memory, most discoveries are made by removing parts of somebody's brain and observe what that person can or cannot do. Because of this, rather invasive study, very few instances exist where a person has given consent to the study of the mind, and this is one of the reasons why this most essential part of our world is not understood very well, compared to other branches of science. Some of the first observations made, was that some memories disappear when a region of the brain matter is removed, and it was concluded that memories are both tangible as well as frangible and are in fact neurons - nerve connections - that can form complex structures that we categories as memories.



For this presentation I have chosen a simplified model of memory management, that may not be the whole story, but that serves as a suitable background, to give some scientific evidence for the model of learning, that I employ throughout the topic.

But first, let me give you some information for navigating the lecture, by telling you about what the presentation is trying to achieve:

- To provide a model of how learning is taking place, that is scientifically founded.
- To provide a list of activities that may lead to learning according to the model used.
- To provide a list of tools to deploy in the design of training courses, supported by this model.

Memory types

For a person, memory may be divided into;

- working memory (a.k.a short term), that is used in the now, to handle the immediate challenges of life, and;
- 2) long term memory, that are used to store experiences and knowledge for later re-use.

In the following I will not spend time on working memory but consider it as a sensory function.

The long-term memory is where information is stored and can be recalled from, and is the part of the mind we are addressing when we want to teach or learn. I will refer to long term memory, when I use the term *memory*, from here on.

Memory may be divided into two types:

- 1) memory that we recall from *consciously*, known as *explicit* memory and;
- 2) memory that we recall from *unconsciously*, known as *implicit* memory.

In other words, some memory is used to deliberately recall specific information, and some memory is used without thinking about it when we perform *tasks* or when we make *decisions*.

Looking in more detail at the *explicit* memory, we find that it is divided into these three useful groups:

- Firstly, *Episodic* memory, which is memory of emotions you have had, normally associated with events. For instance, your first kiss, or that one time, in music camp... What we in lay man's terms would call *memories*.
- Then, *Autobiographic* memory, which is the memory of how you have concluded

that you, and the world works - what we in layman's terms would call *experience*.

- And finally, *Semantic* memory, which is the memory of facts, specific pieces of data or concepts – what we normally would call *knowledge*.



Looking instead at the *implicit* memory, it is also sub-divided into three groups:

- Firstly, the *priming* memory, which is an unconscious support function, that relates context to another memory cue. For instance, the word "nurse" may be recognized more easily if combined with "doctor", rather than some unrelated words such as "bread".
- Then, *perceptual memory*, which is memory of smells, sounds or tactile events.
- Finally, perhaps most relevant for the learning process, the *procedural memo-ry*, which is a collaboration of several neurons, performing some activity, such as making a decision or performing a

physical task, involving several other memory activations, such as driving a car or playing a musical instrument.

If one were to simplify these two memory types and their subsets, it would be useful in this context to say that 1) there is one memory type that pertains to facts, that is addressed in a deliberate manner and that delivers specific data, and 2) another type of memory that is addressed more indirectly, performing more autonomously, that delivers more complex results.

For those of you that studied Blooms taxonomy; what Bloom categorized as the cognitive domain, is mostly the use of explicit memory whereas the *affective* and *psychomotor* domains, relates more to the traits of implicit memory. But where Bloom advices on the categorization of knowledge, the taxonomy is not very helpful in the *attainment* of knowledge.

Coding Memory

Learning is the opposite of remembering...

Where remembering is the act of reading established neuron structures, Learning is the act of establishing such structures.

Exactly how the process goes, is not understood, but as many things in the human body, stimulating muscle, bones, or neurons, leads to strengthening of the area or structure.



Such stimulation takes place by repetitive exposure. Creating a neuron structure and reenforcing it by repetition, *is* learning.

You choose what to commit to memory, your central nerve system manages the particulars. You can, however, make a few strategies to help the process along, by considering what the memory is intended for. I find it useful to divide information into the following two categories:

- **Factual** knowledge that belongs in the *explicit* semantic memory. These are things that is not applied but simply recalled for reference or re-citation.
- **Process** knowledge that belongs in the *implicit* procedural memory. These are memories that are not data, but rather decision making; if this -> then that;

Ways to respond or select, based on preferences.

Factual knowledge may have complex structures that appears like process knowledge, eg. rehearsed checklists, pieces of music or monologs. But they are still characterized by recollection of each element rather than composition based on preference.

Facts or data, that are *applied*, on the other hand, are often *process knowledge* since they tend to be selections based on a preference, such as choosing a shorter path to save time and fuel.

Lastly process knowledge that entails *feedback* from the sensory system is also implicit procedural memory, that rely on having tactile, visual, or auditory input as part of the decision-making process. This is commonly called a *skill*.

Knowing something from the explicit semantic memory (facts) is seldom very useful, as it has no practical application without context.

For most things in life, knowledge only becomes useful when it has application, and for this reason we have more use of knowledge in the more autonomous implicit memory (the unconscious memory), as it functions more efficient without the larger cognitive load of using (at least most parts...) of the explicit memory (the conscious memory).

Learning process, semantic memory (Factual knowledge)

If you wish for someone to learn something that belongs in the semantic explicit memory, you put the learner in a position where the person is presented with the knowledge AND needs to recall it from memory. Let's call these two elements, of push and pull, *exposure*.

As a trainer you need to determine to what level the factual knowledge must be recalled, and perhaps how quickly. The more readily and precise the recollection needs to be, the more exposure you must put on the learner. This is known as *rote-learning* or learning by-heart.

Rote-learning is very economical for the training organisation since it calls for very little preparatory resource and is conversely often disliked by learners as it is not very enjoyable to exercise. But it illustrates very clearly to us, how the memory coding process works.

Learning process, procedural memory (Skill)

To have learned something in the procedural memory means that you have a skill. A skill need not be a physical ability but may also be a cognitive activity. I could be a process that involves deciding; whether the arm have moved far enough to reach the gear shifter, involving physical feedback, or it can be to decide whether "a" or "c" is the better answer in a MCQ.

If you wish for someone to learn something that belongs in the procedural implicit memory, there are described 3 states to identify the progress of the learner:

- the cognitive phase: The learner knows what to do but cannot yet do it.
- the associative phase: The learner is doing it, but not to the required standard.
- the autonomous phase: The learner is doing it, to the required standard.

Committing something to procedural memory entails, that you first commit the process steps to the explicit (conscious) memory before it is transferred to the implicit (unconscious) memory.

What I previously referred to as exposure, is commonly referred to as "to practice" when we try to commit something to the implicit (unconscious) procedural memory. It can be kicking balls around or solving math problems. Each repetitions enhances the organization of the *conscious* memory recollection to become *unconscious* memory recollection.

Context in the learning process

Having a bunch of lexical knowledge is hardly very useful and may even be annoying to your surroundings. Only when it has practical application is knowledge useful to us. It is therefore essential to the effectiveness of a training course that it supports the transfer of knowledge from the explicit to the implicit memory.

If you provide *context* to the knowledge, you wish the learner to pick up, you begin to utilize a broader range of memory functions and you are no longer relying on rote-learning but on more

refined learning-types e.g. meaningful learning or active learning.

Firstly, if you let the learner see a broader perspective the person may connect the knowledge to other already existing memory structures, either in the same memory type or in other domains.

Secondly this, connecting to existing structures, requires less effort and is often perceived as a more pleasurable way of learning as the learner may have an experience of understanding and that the learner is already partly informed on some of the concepts presented.

This is sadly not as popular with training organisations as it requires more tailoring of the exposure, which must be matched to the learners existing knowledge to have effect. Setting prerequisites for course participants is one way of securing a qualified learner, but that also entails a smaller marked for training course offered.

Generally speaking, this is how universities utilize that applicants have certain qualifications from High school. In your use-case, it may be less apparent what is available to build on.

If you engage existing knowledge already present in the learner, you may have a dramatic increase in training effectiveness, since you do not need to show applicants how to read or count and in that the learner takes an active part in the exposure process.

However, it requires maintenance. You must adapt your exposure to match your applicant's initial level and you may also be required to employ some additional quality assurance since elements learned earlier in life, may no longer be present, if learned at all.

Motivation.

- You can lead a horse to water, but you can't make it drink.
- You can send a kid to college, but you can't make him think!

In the previous sections we saw how you need to identify the knowledge you wish to convey according to the applicable memory type and how to employ a compatible amount of exposure, that is commensurate with the level of abstraction, or skill, you require from the learner.

A trainer can supply exposure, to the explicit memory, but nothing will be transferred to the implicit memory unless the learner decides it.

In other words, a trainer will only succeed if the learner is *willing*. We usually refer to this - the learner's willingness - as *motivation*.



In the earlier Victorian school system, the prime motivation was **fear**. But as we are no longer allowed to use physical punishment, fear is not an effective motivation. I honestly doubt that it has ever been an effective motivation, as it has only a small momentum resulting in learners most likely loses motivation, as quickly as the instrument of fear leaves the field of vision.

In the work place it may still carry some significance as some people may be concerned about



their future if they fail a learning task. But it is not a very productive learning instrument as it impedes on our cognitive ability as it binds mental resource to the persons defence mechanisms.

To maximize the training effort, motivation should be based on elements that will provide access the willingness of the learners and support the learner's efforts. This is simply achieved by making as much of the learning activity as possible, a *positive experience*.

But very rarely can the entire thing be a pleasant experience as most people need a bit of crisis for them to move and learning things therefore often include struggles. If your course design is centred on supporting the learning effort, your milage will increase.

Some essential examples of things that will motivate learners are found in the next sections. Necessity or usefulness.

If you can convince the learner that the knowledge you offer, is required to achieve a certain desirable goal, the learner will engage in the learning struggle, based on a desire to have the result that the effort may yield.

For example, you need to learn the rules of the road, which are boring and arbitrary, but your effort will permit you to drive the car, which is exciting and useful.

Sensation of success or accomplishment.

Learning takes effort from the learner. And, as it is a struggle, and often a trial-and-error process, that initially appears much harder than it actually is, many persons may have their motivation decline by experiencing failure.

You should keep this in mind and ensure that your design leads to a resolve, so the learner have an experience that *ground was covered*; that a goal was achieved or that a competence was gained. This will maintain a sensation with the learners, that the effort paid dividend and maintain or even increase motivation.

Sensation of manageability.

Another element that may support (or sabotage) the learner, is the persons access to an overview of the learning task, to determine the magnitude of the required effort.

When a person has a good understanding of how much effort is required, that person will have a feeling of control and the ability to organize the learning effort.

On the other hand, if a person has no idea if the learning task is something that will take a long time or if it is a simple task, the effort will tend to create a stressful environment, as the learner does not know what level of alertness is required.

One way to support this is by showing the learner what the learning task is and by what method the learning task will be solved. This is valid for both your presentation of your course as well as for each learning activity.

Lots of other elements may support the motivation of the learner. Some of the common external issues are:

- not having too long sessions, which supports the feeling of manage-ability with the learner, or
- having a comfortable seat or room temperature, not to distract the learner from the task at hand.

Other common elements are:

- recognize physiological needs, such as bathroom breaks, fresh air and
- that the digestive system requires a lot of energy, leading to a limited cognitive ability after a meal.

The trainer

The most important element though, is whether the learner sympathizes with the trainer (or CBT training system). E.g. we tend to revere trainers that have a lot of field experience and we are sceptical of trainers that appears to be lightly equipped for the task.

On the other hand, we may be repelled by a trainer with loads of experience, if the person act with arrogance, just as an inexperienced trainer may have every-one's attention if the person appears honest about personal limitations.



We all have personal preference to what we enjoy in a trainer, but in essence people need to *like* the person that is trying to manipulate their memory as well as they need to *accept* what that person is doing to them.

On the *one* hand we must recognize that learning takes effort and the trainer must support the struggle. On the *other* hand, we should not be afraid of putting demands on learners as training is a leadership activity Trainers must accept that they are leading learners towards learning and creating a movement of the participants.

Other learning barriers created by the trainer

Training should be a shortcut to learning. Make sure your presentations are conveying the message easier than text otherwise presentations have no use. If you want to present text, rather distribute it in advance so people can read it for themselves. It may sound harsh, but if you do not have a shortcut to offer, you are not required. Examples could be that you provide, a method, a useful interpretation, or a tool.

Topics should have contrast. The topic you present to the learner should not be a monotonous event. Your presentation must have contrast, so learners can distinguish between what is the important bits and what is stuffing to support your message. If everything is equally important, nothing is important. Typical methods are repetitions or activities stressing the points you are trying to make.

Though the training topic may be familiar to you, remember that it is perhaps a lot to take in for those that have not heard about it before, and you should arrange lectures to have time scale commensurate to the complexity of the topic. In any event, you should never exceed sessions in excess of 45 mins.

Realistically people will not pay attention for more than 20 minutes. So if you are planning a lecture, you should keep this in mind, and supplement your presentation with activities that relieves the learner. Typical activities are short quizzes or simply having 5 minute breaks every 15 minuttes.

Practical training

These mentioned barriers are most relevant in traditional classroom training. If you are conducting practical training, your role becomes more that of a coach, where you have to read the learner to a greater degree and interact to discover what needs the learner have. This requires much less orchestration since each session has its own unique dynamic.



As a coach you should to a greater extend encourage the learner to express what topics should be addressed, since you can tailor the session. But it is not the student who is running the training programme and your role as a coach is to provide a training environment for the learner:

You, the trainer is the one who knows what the learner is supposed to be able to do, and you should ensure that the learner *have* this information.

You, the trainer knows to what level of expertise the learner is expected to perform, and you should ensure that the learner are aware of what level of performance is expected.

You, the trainer should be able to assess the performance of the learner with out prejudice and are therefore able to ensure that the learner leaves the training session with the correct perception of the quality of effort put in by the learner.

You, the trainer should be able to give advice on how the learner should proceed as you should recognize problem areas that are commonly encountered, and provide methods to overcome them.

This is the foundation of a concepts called experiential learning and it is particularly useful in practical training, because it defines simple roles for both the trainer and the learner.

Simply put, this model lets the learner have an experience, this experience is then evaluated by the learner, the learner then reflects on the evaluated experience and are later offered to retry and verify or repeat the cycle. In experimental learning, the role of the learner is to decide what works and what needs to be revised.

The role of the trainer is to assure that the learner is exposed to the appropriate situations witch the learner needs to experience, and that the learner makes the appropriate evaluation(s), so the reflection is focused on the relevant issues, and the proper new strategies are formed.

The cyclic nature of experiential learning clearly dictates progress because it emphasises that the trainer and the learner have a shared reality of the activity. It will also make it effortless to track progress, since every session holds an evaluation of the observed performance and a revision of strategies in the case of substandard results. Most people also like this methodology because it facilitates the development of a relationship between the trainer or trainers, and the earner, which often leads to the employment of other more subtle learning styles, such as rolemodelling and cultural accretion.

References

I hope you enjoyed this presentation and found useful elements in it. I will gladly admit that some of it is conjecture on my part, though I will state that most of it is not my own material.

The models presented are the work of several people. I started out by surveying the topic of memory (Paul Fitts and John Anderson), learning and learning styles (David Kolb, Kurt Lewin, John Dewey and Leslie Wilson) and motivation through the wikipedia articles on these subjects.

There you will also find several references to scientific evidence of the models presented.

I also stand by my claims in the article based on multiple qualitative interviews with learners as well as my own experience as both a classroom and practical trainer in the pilot training industry

MBH 230721