the psychology of e-learning
an epic white paper
The e-learning phenomenon is forcing us to re-examine training. It puts the spotlight on past practice, exposing such practice to the true psychology of learning. But in what way does the psychology of learning inform and support e-learning? This paper looks at several facets of learning and re-examines them in the light of what we now know in the psychology of learning.

1. Do learners learn more using computer-based instruction than they do with conventional ways of teaching, as measured by higher post-treatment test scores?

2. When faced with learning the same things as learners using other approaches, do learners using computer-based instruction generally do so in less time?

3. On prerequisites, can e-learning solve the problem of getting the right learning to the right people at the right time?

4. What motivates learners and what motivational techniques can be used with e-learning?

5. Does increased cognitive engagement in e-learning increase retention?

6. Why is cognitive overload counterproductive in e-learning?

7. Should learning be distributed or massed?

8. How do our measured responses to media affect learning?
9. How should memory theory influence the way we reinforce for retention?

10. Does e-learning help to transfer learning into real results in the workplace?

In the same way that building a bridge is based on sound principles of engineering, one would expect learning to be based on sound principles from the psychology of learning. In practice, in education and training, there is a huge gulf between theory and practice. Much delivery of education and training is disengaged from the psychology of learning.

This is a structural problem. In corporate training, trainers are often plucked from other parts of the organisation or have skills as subject matter experts. They are not given as much training as they require in either the psychology of learning or in any other area of training.

In education, a similar and sometimes more severe problem exists. Lecturers are often subject matter experts, personally driven by leading-edge research. Teaching is often seen as a distraction. They are rarely trained teachers and rarely have any significant knowledge of the psychology of learning.

Even when training in the psychology of learning is given it can often be out of date, relying on theory and texts that were published as far back as the 1950s. In fact, there have been several radical shifts in psychology this century from behaviourism to cognitive psychology and, more recently, to constructivism. Practice tends to lag hopelessly behind this progress in theory.

**BEHAVIOURISM**

**COGNITIVE PSYCHOLOGY**

**CONSTRUCTIVISM**

Behaviourism equated learning with conditioning in response to stimuli. Its focus was largely on external reinforcement. Behaviourists maintained that all learning can be explained in terms of conditional reactions or reflexes and habits formed as a consequence. JB Watson (1878-1958), one of the founders of behaviourism, saw psychology as the study
of observable behaviour and not introspective theorising. BF Skinner (1904-1990) also rejected the study of mental objects, seeing internal processes as irrelevant in predicting behaviour.

Educational psychology then moved towards a deeper understanding of the internal cognitive factors in learning. EC Tolman (1886-1959) was an early proponent of the view that behaviourism must be understood in terms of internal cognitive processes. But it was Noam Chomsky’s devastating critique of behaviourism in 1957 that marked the start of a new era in cognitive psychology.

Constructivism has moved us on even further in understanding how the learner constructs as they learn. Constructivism is an educational philosophy which holds that learners ultimately construct their own knowledge that then resides within them, so that each person’s knowledge is as unique as they are. This school is heavily influenced by Vygotsky. Although published in the Soviet Union in the first half of the century, he wasn’t well known in the west until later in the second half of the century.

Although the psychology of learning has gone through these paradigm shifts, with significant increases in knowledge of how we learn and how learning can be improved, corporate training has often not kept abreast of the changes. Research is poorly disseminated, if disseminated at all; and, even when made available, is rarely read or applied.

In practice, training is still largely grounded in behaviourist theory and on external factors, ignoring internal thoughts, feelings and cognitive factors. For example, Mager’s book on behavioural objectives, although published nearly 40 years ago, still casts a heavy shadow over training practice to this day.
Training is still dominated by the delivery of content by trainers in classrooms. This focus on trainers, trainees and classrooms is rooted in a view of the learner as the recipient of learning, not the active, motivated, cognitively complicated, constructivist learner that the psychology of learning has uncovered. The sheep-dip, chalk and talk experience, so common in classroom-based courses, is often significantly behaviourist in design and delivery.

As the psychology of learning has become more learner-centric, so too must the delivery of learning. Some of the obvious gaps between learner-centric theory in the psychology of learning and behaviourist practice in training include:

- Dominance of ‘tell’ mode
- Poor prerequisite analysis
- Little focus on motivation
- Low levels of cognitive engagement
- Cognitive overload is common

- Most training is sheep-dip, not distributed
- No reinforcement
- Transfer problems

In this paper we explore the possibilities that e-learning offers in relation to these problems.
effectiveness

‘Learners learn more using computer-based instruction than they do with conventional ways of teaching, as measured by higher post-treatment test scores.’

This is the view expressed in the nine-year survey of the research literature in training published by Fletcher and Tobias in Training and Retraining, commissioned by the American Psychological Society, published in 2000.

‘Students who took all or part of their class online performed better, on average, than those taking the same course through traditional face-to-face instruction.’

This extract is taken from the 2009 Evaluation of Evidence Based Practices in Online Learning, published by the US Department of Education.

Several earlier studies confirm that learners learn more using computer-based instruction than they do through traditional classroom methods:


One reason for the improved effectiveness seems to be the increased level of participation through interactivity. This leads to higher levels of cognitive engagement and therefore higher levels of retention. In short, participation increases retention.

The self-paced nature of the learning experience also leads to higher retention as the learning content is digested at the pace which suits the learner and not the pace at which it happens to be delivered by the trainer. The learner can stop, reflect, repeat and integrate the learning into existing structures in a way that is difficult in the classroom.

Of course, this all depends on the quality of the designed content. However, it would seem that the quality of text, audio, graphics, animation and video is likely to be instructionally superior to the low quality media normally available in traditional training environments.

- E-learning can be more effective than conventional teaching
- Participation increases retention
- Self-paced learning increases effectiveness
- Consistent, high quality presentation increases effectiveness
- Effectiveness of e-learning depends on quality of design
When faced with learning the same things as learners using other approaches, learners using computer based instruction generally do so in less time.

This again is the view expressed by Tobias and Fletcher when they surveyed the research in this area. Time saved varies from 30% to 60%. Research by Brandon Hall in 2001 showed similar results.

Citations can also be found in Web-based Training Cookbook by Brandon Hall, John Wiley (1997). Specific studies by Fletcher (1999), Kulik & Kulik (1991), Lesgold et al (1990) and Orlansky and String (1979) are:


In addition to these stated time savings, we have the time saved in not having to travel to a classroom, then go through the introductions and set-up processes that the classroom demands.

But on a straight comparison, there appear to be several reasons for this increased speed of learning. The self-paced nature of the material, with its one-to-one experience, eliminates unnecessary time spent waiting until others in the group catch up and have queries answered. This seems to accelerate the rate at which learning takes place.
The telescoping of time with images and other media types, presented immediately to the learner, greatly speeds up the rate and quality of presentation. Images on flipcharts or overhead projectors are often slowly presented and of poor quality.

- E-learning is faster than conventional teaching
- Typically 30%-60% faster
- Self-paced learning is faster learning
- Consistent, high quality presentation speeds learning
- Presentation time is compressed
The most powerful learner variable is prior knowledge.’ Clark & Wittrock

In practice, scheduled classroom courses often have no-shows and cancellations. A considerable amount of training spend is wasted in cancellation charges. Just as wasteful is the filling of cancelled places by ‘filler’ - and therefore the wrong - candidates.

Any course will have a group of learners with varying degrees of experience, educational background, personality types and motivations to learn. A classroom course will hit one portion of this audience. As there is often little in the way of diagnosis prior to the course, what portion of that audience the course hits is difficult to judge.

In practice, for the learner, the course will be too fast or too slow, be too wide or too narrow in focus, aim too high or too low. The trainer often cannot hope to cope with the variations that exist in the group. The classroom is a supply situation; the trick is to turn this experience into one of demand from the individual learner. In this respect, we are failing to recognise a basic lesson in the psychology of learning; that individuals matter and individual needs must be catered for.

This is best done by allowing the user to have a higher degree of responsibility for their own learning. But before they get anywhere near the learning, a needs analysis that is truly diagnostic would mean better targeted training, less wasted effort and less failure. Self-pacing e-learning, along with the ability to repeat and take different routes depending on prerequisites, makes e-learning...
potentially far more targeted with less failure.

Whether a person is qualified to tackle a learning task at a certain level can be determined by assessing what they already know. Some simple pre-tests can quickly determine the suitability of a candidate for the next stage of learning. One of the benefits of e-learning is the online delivery of such pre-tests to the individual. They can assess for themselves what they know, giving others in the organisation, whether it’s their manager or mentor, a true picture of their current level of knowledge. This ongoing assessment can be carried through to the course itself with on-going assessment.

Future learning needs can also be gathered through an appraisal or meeting with the person’s manager or mentor. This data can certainly be gathered electronically and then made available as the basis for selected content. Appraisals, personal development plans and training plans often end up in the bottom drawer, never to be looked at until a year later.

Online systems present plans on a dynamic basis so that the learner and manager can track progress throughout the year.

The online approach also opens up the possibility of intelligent tutoring. As you gather details of the user’s learning behaviour, software can start to make recommendations to make the learning more effective. The more data we gather about you as a learner, the more intelligent our inferences become. There is every possibility that intelligent tutoring will flourish in the online environment.

- Pre-requisites are rarely known in classroom training
- Pre-requisites can be better delivered with e-learning
- E-learning can be tailored to an individual’s needs
- Ongoing learning needs can be better measured
motivation

‘What is emerging most clearly from the technological explosion is, ironically enough, a refocusing on people.’ Laura Winer

What motivates learners?

Motivation may turn out to be the most important issue facing the implementation of e-learning. We must be clear about what actually motivates learners and the motivational obstacles that stand in their way. Only then can we decide on what constitutes good practice, and overcome those obstacles.

Behaviourism, with its emphasis on the external environment, missed the significant role of internal motivation in learning. This is in contrast to overwhelming evidence that can be summed up simply as ‘we really only learn when we want to’. Motivation is, in essence, an internal cognitive issue.

Motivators

Research from Stipek (1996) suggests that learning is enhanced when people are driven by personal, rather than external, drivers. We can infer from this that overall organisational benefits matter less in training than benefits to the individual and their own personal goals.

Self-reference is another powerful motivational factor. Opportunities for reflection, making judgements on your own experiences and realising your own shortcomings, should be included. When learners use self-observation, self-judgement and self-checking, they learn faster.

The degree of control and autonomy by the learner is another motivational factor. When the learner has the ability...
to exercise choice, motivation and therefore learning, is more effective. Examples of control and autonomy include self-paced learning, individual choice of media and individual goal setting.

What research into motivational factors tells us is that learning is essentially a personal experience. The theory tells us to be learner-centric, not trainer-centric. Note that this does not imply that the trainer has no role to play in learning, only that there has been an imbalance.

So what clear lessons can we learn on motivation from research in the psychology of learning?

- Motivation is internal and personal
- Personal goal setting is motivational
- Self-observation, self-judgement and self-checking are motivational
- Control and autonomy are motivational
- Be learner-centric, not trainer-centric

How does this apply to e-learning? Implications for design include; content that must relate to individual and role, opportunity for reflective experiences, individual choice of media and a change in the role of the trainer away from a ‘chalk and talk’ role.

The role of the trainer should move towards support for the learner and not just the delivery of knowledge. Trainers and managers may best serve the needs of learners by motivating them rather than delivering repeated bouts of stand-up training. If it is being repeated it is a candidate for automation.

**Motivational obstacles**

So far we have argued that e-learning can provide a more personal, learner-centric experience but another problem associated with e-learning is the learner’s motivation to even consider, start or complete an e-learning experience. Past experiences, existing perceptions, boredom, high drop-out rates and general dissatisfaction are often
quoted as primary problems. These motivational issues are arguably the most important psychological factor in the whole e-learning debate. We have argued that people learn more effectively and faster using e-learning; it is not clear that they want to.

**Motivational obstacle: classroom equals training**

An obstacle exists, in that prior to the current Internet generation, the entire population of learners has been exposed to little else but the classroom as a learning environment. They have been taught from the age of five onwards to equate learning with courses, curricula and classrooms. In most organisations, training is still synonymous with classrooms and trainers. A typical learner will have gone through up to 13 years of classroom experience in schools, in some cases followed by three or four years of lectures, then back into the classroom at work.

This widespread perception, that learning is synonymous with the classroom, is prevalent in many target populations of learners as well as their managers, and in many cases it also a deeply-held belief in training departments. This is the primary motivational obstacle in the implementation of e-learning. It is a perception, but this makes it no less real. This massively reinforced experience is something that must be overcome if the new models are to take hold.

**Motivational obstacle: a course is time off work**

Another motivational obstacle is the perception that ‘training is a perk’. Some courses are unplanned reward schemes. Learners see the residential course, especially if it’s away from the office, as a reward. Courses are therefore often populated with people who have been motivated, not by the motivation to learn, but by the motivation to have a few days off work or the trip to a pleasant location. This culture is often so deeply imbedded in an organisation that it is
seen as part of your terms and conditions, a perk.

The consequence of this ‘culture of reward’ is that it creates a culture of expectation, where learners feel that e-learning is simply a cost-cutting exercise. This may produce negative reactions.

**Motivational obstacle: training is networking**

Courses do offer an opportunity to share knowledge and network socially with other like-minded individuals. Indeed, it would be no bad thing if it were part of a recognised HR strategy. However, in practice, the social or networking benefits of training are rarely part of any strategic or evaluated goal. They are usually an accidental by-product of classroom or residential training, encouraging people to sign-on for courses which they may not need and on which they have little motivation to learn. This is a management rather than a training issue, but no less important in the minds of learners.

In fact, e-learning collaborative tools provide an ongoing form of community and best-practice gathering that is superior to the snatched moments over coffee, at lunch or in the bar, that training courses provide.

**Motivational obstacle: getting started**

Procrastination has forever been the primary motivational obstacle in learning. How often have we left homework, revision, essays and learning until the last moment, usually forced into action by an impending test or exam?

The classroom has one major advantage in that it provides a degree of compulsion. It is timetabled and learners, once they attend, tend to complete the course. E-learning may have to rely on more voluntary learning where procrastination will prevent action. This reliance on the voluntary learner has to be seriously questioned. It is not clear that even a positive learning culture in an organisation will be enough to encourage participation in e-learning.
Motivational obstacle: e-learning is dull

On drop-out rates in e-learning, there are a number of considerations. Some argue that dropping out is not a sign of failure and that new learner-centric models of learning should allow and encourage the learner to drop out and drop in. Flexibility and access are seen as virtues, not vices. We are so used to the old model of completion and time-based courses that anything else seems inferior. In fact, the psychology of learning points towards spaced learning, and not the fixed time classroom experience, as being more effective. The very concept of the course may be changing as on-demand access to learning becomes available. Indeed, the constructivist approach to learning suggests that we learn through incremental steps, building and adapting our own mental models as we go. This is precisely what e-learning may offer through repositories of learning objects.

Comparisons with the classroom on drop-out rates are also a little unfair, as the classroom is a social space. It is impolite to walk out. People drop-out of the classroom experience all the time. They mentally disengage with the learning experience. They get lost, stuck or simply daydream. Dropping out by walking out is simply socially unacceptable. The difference is that in e-learning, the drop-out is visible. This is an advantage. At least the learner is getting on with something useful.

- People learn effectively and faster using e-learning - it is not clear that they want to

- Motivational obstacle - classroom has been reinforced as primary delivery channel

- Motivational obstacle - classroom seen as synonymous with training

- Motivational obstacle – training as a reward, time off work

- Motivational obstacle – classroom training effects networking
Motivational obstacle – not starting through procrastination

Motivational obstacle – perception that e-learning is dull

Drop out rates indicate motivational problems in e-learning

Learners also disengage in the classroom but it is not as visible

Overcoming motivational obstacles

The voluntary user needs to be sold the message. This new type of learner is a consumer. This means marketing and selling. E-learning has to be launched like a product. It is new, different and sometimes threatening. Fears must be overcome and interest stimulated and sustained.

In practice, motivation is a practical activity that needs to recognise key motivational factors, then apply techniques to make them work. A planned marketing strategy and budget is exactly what is needed.

This means identifying key messages, branding, strategy, tactics and a practical implementation plan with milestones.

Branding: When Gartmore, the investment company, launched their e-learning programme, they branded it OWL (Online With Learning). Furry OWLs were distributed and Ollie the owl became the buzzword rather than the e-learning initiative. This simple, but effective, tactic made the learners feel as though this was something for real people rather than a technology initiative. They highly recommend a brand that is as far away from technical jargon as possible.

Pre-launch activity: Emails, flyers, seminars, tasters – there's an endless list of simple marketing techniques that can be used to stimulate interest and intrigue. This often makes use of marketing collateral that already exists in the organisation, such as the company newsletter or intranet. Use whatever channels of employee communications you can find.
Launch activity: A conference is often an ideal environment for such a launch. You may get most of the senior managers in one place at one time. A launch also needs marketing material. If the managers on the ground need motivating, give them packs or a module that gets their buy-in. A real-time event may also be useful.

Get managers and learners into a room and show them how easy this stuff is to use and the strength of the content.

A senior evangelist: If you can get the CEO or other senior manager to take the course and sing its praises, this will do wonders for its effectiveness down the management line. It will dilute the 'yet another IT initiative from on-high' effect. In Cisco, John Chambers is the company’s greatest e-learning evangelist. He goes on television to sing its praises and even included it in his company advertisements.

Many evangelists: A dedicated e-learning team chosen for their enthusiasm and skills will act as their own evangelists within an organisation. Better still, sponsors and line managers who ultimately make sure that things happen on the ground.

Cascading emails: Prudential, in the US, used a cascaded system where every learner got a personal email from the manager most respected in the mind of that learner. If the email comes from too high in the organisation, it will seem too remote. If, however, it comes from the manager who is responsible for your personal advancement, it becomes more relevant.

Accessibility: The primary form of access may be the desktop, giving 24/7 access but other ideas may also be used. A clearly identified space or workstation in the corner of a large open-plan office acts as a marketing tool in itself. It can draw learners into the process and act as a ‘quiet space’ freeing the learner from interruptions and keeping the experience anonymous.

Compulsion: If a new IT system is being rolled out, put a deadline on completing the learning and do not give access to the
new system until the course is completed. This technique has been employed by several companies. PPP healthcare did precisely this before upgrading everyone’s desktop. Another approach is to put strict deadlines for completion with a check on scores and tracking data by senior managers. The idea that reports containing a list of those who did, and did not, complete the course going up the chain of command can be motivational.

Make it matter: If you put the e-learning experience into existing appraisal and review processes, few employees would risk a poor review as it could affect their chances of promotion or a pay rise. Direct causal links between the mechanisms used to track personal development and the completion of the training will encourage use.

Completion certificates: A simple certificate that the user can print out at the end gives a tangible outcome to an intangible experience. This is appreciated by individuals who feel their effort has been rewarded. Completion is equated with achievement. It is a simple form of praise that rarely fails.

Reward structures: Prizes and individual rewards can vary from the trivial to the expensive. These have long been used as motivational tools. Vouchers that can be printed out on completion, small gifts or draws for major prizes can all be used to pull people towards completion. On a smaller scale, emails recognising completion from immediate and other line managers show that the organisations care.

Course dependency: If there is a classroom experience as part of your blend of learning and if this as seen as a reward in your organisation, make attendance dependent on passing the e-learning course. E-learning can be used to bring everyone up to a similar standard.

Peer pressure: If the learner has to complete the e-learning experience in order to be involved in a real task that involves a real team, then peer pressure can be used to push the learner towards completion.
Make completion a team objective.

Realtime events: An event that takes place at a pre-determined time such as a live chat, survey, question and answer session or vote can focus the learner on an actual completion date. This anchors the e-learning in the real world to a real time.

For e-learning to succeed, we need a learning culture in which individuals take some, if not all, responsibility for their own learning. This will take some time to achieve as cultural inertia, organisational structures, past behaviour and fear will need to be overcome.

- Brand the e-learning initiative to free it from ‘technology’
- Pre-launch activity to stimulate interest and intrigue
- Launch with verve
- CEO or senior manager support will stimulate interest
- Cascaded emails link e-learning to immediate management interest
- Compulsion may be needed
- Maximise accessibility at desktop or through learning workstations
- Make it matter to the individual’s personal development
- Certificates on completion
- Rewards such as prizes or draws
- Make rewards such as classroom courses, dependent on e-learning completion
- Include peer collaboration and therefore peer pressure
- Realtime events mean actual participation
Whether it is e-learning, the classroom or any other form of delivery, it is clear that cognitive engagement is a necessary condition for success in learning. Good trainers do engage with their audience. They structure engagement through practical exercises and other activities. But this is not always the case. A considerable amount of classroom training is still ‘tell and test’. On one hand the classroom can offer lots of social interaction between learners. However, the classroom or group environment often makes individual cognitive interaction difficult. Well designed e-learning content has high levels of interactivity. If this interactivity is relevant it can greatly increase retention, and because there is the possibility of increased levels of simulation, the degree of interactivity can potentially be carried through to very high levels of cognitive engagement. This is clearly demonstrated in computer gaming.

**Meaning matters**

Making the content more meaningful, distinctive, vivid, organised and personal increases retention. Organised material is better retained than unorganised material. Context is another important factor. Meaningfulness influences recall in that the interrelationships between pieces of information matter. Our familiarity with the content also influences meaningfulness, Thorndike & Lorge (1944), Paivio, Yuille & Madigan (1968).

**Self-reference**

The self-reference effect, where memory is enhanced by reference to the individual
The learner has been shown to be significant i.e. ‘How does this apply to me?’ Klein & Kihlstrom (1986). This personalisation of material will increase retention and can be used to good effect in learning in the workplace by relating learning directly to the person’s own job, aspirations or daily tasks. The very fact that e-learning can be used when the user needs it i.e. in response to a task that needs to be done, makes it personal in a way that the classroom may struggle to match. The accessibility and convenience of e-learning is in itself a move towards personalisation. This is not a trivial point. Learning is best done when the learner is in the correct mood or state of mind for learning. With e-learning the learner can choose when to learn and not be restricted by the tyranny of the course timetable.

**Primacy and recency**

Ebbinghous discovered the serial position effect. In remembering lists, he observed that people are far more likely to remember items at the start and end of lists. These effects are called primacy and recency. It depends on the nature of the material, the relationship between the material and users approach to learning, but by and large the principle is that material from both ends of a learning experience is retained more than the stuff in the middle. This has been confirmed many times since, most notably by Murdock (1962).

Take the example of the Presidents of the US. Most people remember Washington and the more recent Reagan, Clinton, Bush and Obama. Incidentally, many people also remember Abraham Lincoln, confirming another psychological effect in learning, the von Restorff effect (1933). He found that the more something stands out from the crowd, the easier it is to remember.

In a specific experiment by EJ Thomas in Studies in Adult Education (1972), it was found that there was a massive dip in attention and recall from the middle of lectures. In other words, in lectures and...
the classroom the effects of primacy and recency are profound. The strength of opening events and summaries has long been recognised in learning practice.

**Images matter**

Related to meaningfulness is the imagery value of knowledge i.e. the strength or vividness of the visual or sensory image, Paivio, Yuille & Madigan (1968). A picture speaks a thousand words and this is confirmed in memory studies that show that imagery is a powerful aid to memory and retention, Shepard (1967). In this classic study, people were shown 612 pictures. The subjects were shown pairs of images and asked to identify which one they had actually seen. Success rates of 97% after two hours and 87% after a week were impressive.

E-learning gives us the opportunity to use a wealth of relevant imagery in learning. Animation can bring learning points that demand movement to life. Photographic images can bring a range of real people into the learning experience. Flowcharts can clarify complex processes. Icons can aid navigation. The web is full of exciting imagery and leading-edge graphics and as bandwidth increases the opportunity for images and moving images explodes.

**Metacognition**

Metacognition, or the ability to 'learn how to learn', has received considerable attention in research, yet little seems to be applied in practice. When we monitor, evaluate and plan our learning, the results of our labours are more fruitful. This is an area where massive increases in productivity are possible if theory can be turned into practice.

Our ability to distinguish between what we know from what we don’t know plays a significant role in how we learn. Those who think about how they think enhance their learning. They initiate, choose and control the learning experience making it more productive.
Students must digest knowledge relating it to their previous experience and synthesising it into their existing cognitive structures. Telling, by itself, is not sufficient. At the simplest level, learners can be given generative techniques including note-taking, creating summaries and creating analogies. These generative techniques have been shown by Kourisky and Wittrock (1992), to lead to a 30% gain in learning.

Note-taking has been shown in many studies to increase the effectiveness and transfer of learning. Dee-Lucas and DiVesta (1980), Peper and Mayer (1986), Shrager and Mayer (1989), all showed how note taking increased learning and transfer across a range of learnt subjects. The generation of summaries and analogies were shown to increase learning by 30% and 22% respectively, by Whittock and Alesandrini (1990).

- E-learning provides more interactivity than conventional training
- Organised material matters
- Context and interrelationships matter
- Familiarity matters
- Self-reference effect – relate to individual
- Primacy – load front-end with most meaningful event(s)
- Recency – load back-end with meaningful summarised material
- Relevant imagery increases retention
- Note-taking increases retention
- Generating summaries increases retention
- Generating analogies increases retention
‘Less is more!’ Mies van der Rohe

The classroom course or university lecture is often delivered in hour, or longer, sessions. Despite the fact that attention span studies show a sharp drop-off after 10-20 minutes, little is done to address this known phenomenon. In practice, the trainer has to lift the audience with a change of activity, pace or form. In general, too much is presented for too long.

When learning, less often means more. Experts often fail to compensate for novices by presenting knowledge in an indigestible form. In particular, SMEs (Subject Matter Experts) often insert and add text information that is counterproductive, in that it results in cognitive overload for the learner. In other words, more content can mean less learning. The cognitive load must be managed in such a way that the learner can proceed by absorbing small amounts of meaningful information, rather than huge lumps of learning, whether it is text, audio or video.

A study by Mayer, et al (1996) presented 600 pieces of scientific learning and found that briefer versions, which were concise, coherent and co-ordinated, resulted in more effective learning. They are precise in their recommendations:

‘There is a clear pattern in which the more words added to the core verbal explanation, the more poorly the student does in producing the core explanatory idea units. These results are consistent with the idea that the additional words overload verbal working memory, drawing limited attentional and comprehension resources away from the core verbal explanation.’
A review of studies around this concept, known as the redundancy effect, by Sweller et al (1998), cites a list of research studies that all point to the damage done to learning when redundant material interferes with the efficacy of the learning.

Avoiding cognitive overload

When designing content, make sure your SME understands the redundancy effect and quote the academic references to reinforce the point. Another is to structure content as learning objects that can be used by the learner to construct their cognitive models. There is some sense in splitting learning resources down into manageable chunks so that cognitive overload doesn’t get a chance to overwhelm the learner. Interestingly, the screen in itself, when used sensibly with adequate amounts of white space and good design limits over-heavy and over-large chunks of content. Bookmark facilities, navigation that allows replay and going back through content and regular checks on understanding also give the learner the ability to avoid overload.

- Redundancy effect is the result of cognitive overload for the learner
- More content can mean less learning
- SME pressure to add information is often counterproductive
- Make SME aware of redundancy effect
- Learning objects chunk learning into a digestible form
- Screen presentation chunks learning
- Good navigation and a bookmark facility controls overload
‘Little and often’.

Let’s ask ourselves a simple psychological question. Is it better to deliver learning in one large single dose, or little and often? The answer is clear. Little and often is better. Distribute the learning over time, do not deliver it in one concentrated session. There is much evidence to support the idea that learning is best spread over many days rather than crammed into a few.

Ebbinghous (1885) is famous for having discovered that the size of the learned material was significant in recall. Short lists could sometimes be learnt in one session, but the longer the list the more often it had to be practised, and the more often the list was practised the better the recall. A less well known, but just as significant, discovery was the benefits of distributed practice. Distributed practice is spread out over a period of time, whereas massed practice takes place in one session. The spacing out of practice seems to avoid fatigue effects and lead to more consolidation of memory. Consolidation seems to be optimal after about 20 minutes, suggesting that we should practice and reinforce learning after 15-20 minutes.

Over a century of studies confirm the benefits of distributed learning. One typical study was made by Baddley and Longman in 1978. The Post Office were just introducing postcodes. However, it was the postmen who had to input the codes through keyboards as automatic sorting machines were not available. The Applied Psychology Unit in Cambridge compared the rate of learning across four different groups. Those learning just one hour a day over four days did better than those who spread their learning over two days, who
in turn did better than those who did one four-hour session in one day. On both rates of ‘acquisition’ and ‘retention’ the group who spread their learning over four days did better.

Courses are like morphine injections. They are expensive, induce a brief period of euphoria then leave the user with a slightly empty feeling some time later. This emptiness is also likely to be an emptiness in recall as the knowledge decays from short-term memory. A slow release mechanism is required, tailored to the need of the individual learner. The released doses need to match the capacity of the user’s need to learn. To take this analogy further; to combat pain, morphine used to be delivered in large measured doses by single injections. These days, morphine is released through patches on the skin and other slow release mechanisms. In many cases the patients are left to administer their own doses in reaction to their own perception of their own pain. The patient matches supply to demand. This is better on both cost and effectiveness.

Learning would be both cheaper to deliver and more effective if delivered across a period of time in small amounts determined by the user.

This is not simply a matter of better retention and therefore more effective learning. Little and often may also be more convenient for the learner. To have access to learning on-demand will fit into whatever pattern of work the learner has. Many jobs have ‘feast and famine’ patterns of work, periods of intense activity interspersed with periods of calm. The timely delivery of learning means that the learning can be delivered in doses to the right people at the right time.

- Conventional learning is concentrated, not distributed
- Little and often is better
- Distributed learning avoids fatigue
- Distributed learning increases retention
If the designers of media would only follow their guidance, we would all gain through enhanced social graces in our interactions with media and technology.' Donald A Norman

Reeves & Nass (1999) have undertaken 35 psychological studies into the human reaction to media and attributes presented in media, at Stanford, presented in a book called The Media Equation. These studies all point towards the simple proposition that media equals real life. By this they mean that people react towards media socially and naturally, even though they believe it is not reasonable to do so. They can’t help it. In short, people think that computers are people.

Why should this be so? Well, we evolved in a world where humans exhibited rich social behaviours and in a world in which all perceived objects are real objects. Anything that seems real is taken to be real. Think of a ventriloquist – it’s hard NOT to see the puppet as a real person - similarly with good e-learning. We do not willingly suspend disbelief, it just happens.

One of their general findings is that the more a media technology is consistent with social and physical rules, the more enjoyable the technology is to use. This conforming to human expectations means giving people feelings of accomplishment, competence and empowerment. People like to be praised by other people, even when that praise is undeserved, and people like computers that flatter them.

What follows are some specific findings from their lab research that throws up interesting design recommendations for e-learning.
Arousal

Research showed that if you arouse people at the start, they will remember more. Initial emotional impact seems to increase the brain’s state of arousal, making it more receptive to learning.

This is a strong argument for emotional engagement at the start of an e-learning programme and not the usual list of behavioural objectives. Intrigue, surprise, a moment of self-reflection or some other opening event that has emotional impact will improve attention and recall.

Politeness

Dialogue works because there are social rules of politeness in conversation. It’s polite to say hello and goodbye and polite to look at people when speaking. This seems obvious.

However, in e-learning, interfaces can be very stark and uninformative. People like to be greeted when they enter a programme, be treated politely as they proceed, and they like to part on good terms and not be ejected without polite dialogue on exit. An obvious example of this in practice is the ‘Are you sure you want to exit?’ dialogue in many software applications. What few of them do is say ‘Goodbye’ or ‘Thank you’ when you choose ‘Yes’.

Flattery

Everyone is a sucker for praise and insincere praise is better than no praise at all. Computers should praise people frequently, even when there is no reason to. Remember also that praise and blame are asymmetrical - we love to be praised and hate to be criticised.

So give out criticism carefully and sparingly. Avoid negative feedback that you wouldn’t give in a real conversation. We seldom say ‘incorrect’, ‘wrong’ and ‘no’ in actual conversation so use conversational terms in e-learning feedback.

Negativity

One has to be careful when presenting negative experiences,
however. Negative events do grab attention and wake up the processing system. In fact, experiences that come after negative events are better remembered.

So, although negative modelling, or the explicit presentation of bad practice, has to be handled carefully, if you do want to show a negative event, put the negative event first or up front in a programme to increase arousal and subsequent recall.

People

People like identifiable personalities. The personalities in media should be consistent and strong. Mixing personalities weakens the message. Indeed, learners are heavily influenced by testimonials from their peers and experts.

This respect for experts is basic and should be employed in learning experiences. We retain more when the message is delivered by an acknowledged expert or authority.

Team

Group effects are powerful. People admire and respect others in a group. Identity, even a group name, matters. Merely saying that tasks are team efforts matters.

User and designer should speak to each other as if in a team and use the language of we, us, our, you etc.

Video

Interestingly, there are no psychological advantages for image fidelity. Two studies at separate universities came to the same conclusion, namely that high budgets on high production value video may be wasteful, as it does not significantly increase learning.

Interpersonal distance

Realism matters and close-up shots are compelling. Indeed, attention and memory are enhanced when pictures are close and big.

Use close-ups when using images of people, presenters,
guides etc on screen, and use POVs (point-of-view) shots for interpersonal dialogue such as interviews.

**Audio**

Unlike video, poor audio fidelity is psychologically unfamiliar, as most spoken audio is delivered and heard at high-fidelity.

Audio is, therefore a good place to invest, delivering more bang for your buck.

**Voice**

For some applications voices may carry baggage and a badly cast voice is worse than no voice at all. Multiple voices can also complicate an interface.

Be careful with the use of inappropriate voiceover artists, accents and multiple voiceover narratives in the same e-learning programme.

**Timing**

We dislike unnatural timing. Slight pauses, waits and unexpected events cause disturbance and audio-video asynchrony such as poor lip-sync or jerky low-frame-rate video are cognitively disturbing and will result in negative views towards the speaker and delivered message.

No video is better, in learning terms, than low frame rate video, which has synch problems. These problems are cognitively disturbing.

**Animation**

Constant motion is bad and learning improves when there are visual rests as memory is enhanced when people can stop and think. Similar results have been reported by Jacob Nielsen in his usability studies in web design, where users have been known to put their hands over disturbing animations so that they can read the screen text. Note that this does not apply to movement or animation which is meaningful in terms of learning e.g. flow through pipes in technical training or a demonstration of the movement of money through a series of financial institutions in banking.
Above all, avoid peripheral motion such as clocks, ticker-tapes etc. as they distract from learning unless they are an integral part of the learning experience.

**Summary**

These studies are simple but fascinating. People’s responses to media are fundamentally social and natural. Our responses are not willed, they are automatic. These studies give us empirically-tested results that objectify the advice.
‘As long as trainees are happy and do not complain, trainers feel comfortable, relaxed, and secure.’ Donald Kirkpatrick

Short and long-term memory

Ebbinghous, published a landmark book in 1885, Uber das Gedachtis (On Memory). Most subsequent research into learning and memory has been footnotes to his work. He put the study of memory on a sure scientific footing using rigorous experiments and his findings were clear. In perhaps his most famous experiment, trying to remember syllable lists, he found that after certain periods he remembered only a percentage of the original:

- 20 mins 58%
- 1 hour 44%
- 24 hours 34%
- 31 days 21%

In other words, within a month nearly 80% of the learned content had been lost. But the real lesson was that most of the loss came in the first few minutes. The distinction between short and long-term memory was made and it became clear that successful learning had to push knowledge from short to long-term memory to be successful. Of course, it is not simply a matter of practice and reinforcement. Related meaning and the organisation of the material are also important.

There has been well over a century of research refining the models of short and long-term memory. Yet how many who deliver learning pay any attention to the issue? The single dose, classroom delivery, sheep-dip experience does little to shunt knowledge into
long-term memory. Scientifically, this is likely to result in an 80% memory loss within a month of completing the course. So, if we could find a way to reinforce effectively we could increase our learning productivity by 400%!

**Reinforcement and retention**

Sheep-dip training is a one-off injection of knowledge. At the end of the experience learners are sent off with their folder of course notes under their arm to fend for themselves. This is a formula for failure. The learner has to plan and execute his or her own programme of reinforcement if the bulk of the learning is to stick. Retention comes through reinforcement.

To abandon the learner like this is to abandon any sensible theory of learning. Unless the learner is one of those very rare people who are wholly self-motivated and diligent then much of the learning will quickly evaporate from short-term memory. As we have seen, over a century’s worth of theory and experimental psychology has shown how important it is to push knowledge from short to long-term memory. But the theory is only as important as its practice. In truth, most education and training offers bad practice in direct contradiction to the sound theory.

It is not difficult to see why the course is king. Courses are self-contained. They can be named, planned, costed, timetabled, delivered and ticked off as completed. The act of delivery alone is often enough to satisfy the organisation. Yet courses are rarely evaluated. The real output and results are rarely measured. We are satisfied with the happy sheet, which reflects little more than a short-term rush of enthusiasm. Within minutes the process of decay from short-term memory starts and much of the effort has been in vain.

The immediate reinforcement of theory into practice gives a massive boost to retention inducing the sort of behavioural change that the user wants. Courses are not the most effective vehicles for effecting behavioural change. Arguably
courses may hinder behavioural change by discarding reinforcement in favour of convenience. Convenience for the training department or educational institution, not the learner.

**e-learning and reinforcement**

The on-demand nature of e-learning frees delivery from the artificial constraints of a course timetable. Learning can be delivered when it is needed prior to the task at hand. This means that practice in the workplace is the reinforcing agent. It is this proximity of learning to actual practice that can give e-learning a much higher retention rate.

The fact that an e-learning experience can be repeated on demand is another advantage. A learner who has learnt how to reinforce will naturally revisit material, to make the content stick or practise their skills. This is especially important for skills that are used periodically e.g. interviewing or disciplinary interviews.

Another level of reinforcement in e-learning comes through the power of the network to deliver reinforcement events. These can be emails, screen savers, synchronous events where experience is shared, reminders to complete action points, online tutor support and so on. Learning can be reinforced by simply using the technology to push the process of learning forward.

- 80% of knowledge is lost within a month
- This leaves a potential 400% productivity gain
- Sheep-dip experience does NOT reinforce
- On-demand e-learning allows immediate reinforcement in the workplace
- On-demand e-learning allows repetition and therefore reinforcement
- Networks can be used to push reinforcement to the learner
Classroom training too often presents content outside of the job context, increasing the probability that the knowledge learned may result in inert knowledge.

Ruth Clark

Transfer is the move from learning something to applying that knowledge or skills in the real world. Traditional training often ends with a final test or happy sheet. Neither help in evaluating the transfer of learning to the job, task or performance in the real world. Indeed, methods designed to ‘pass the test’ can positively interfere with the transfer of learning to the real world.

Courses themselves may also damage learning by causing re-entry problems. If you pluck someone out of their place of work, unless there is resource to cover and the management skills to organise that cover, the work will pile up ready for the learner’s return. The already antagonised manager, who has lost one, or many, of his or her staff to the course then puts pressure on the re-entrant to clear up the accumulated mess. At the very time when the application of knowledge is needed, the opportunity is destroyed. Courses can therefore interfere with transfer.

Transfer problems are well documented and researched. Near-transfer includes simple procedural knowledge and tasks such as knowing how to make a call on the organisation’s telephone, far-transfer includes troubleshooting and problem solving. Traditional ‘show me, try it, then correct’ strategies work well for near-transfer. Far-transfer, however, needs repeated exposure to different perspectives and instances of the core problem or task. Varied content allows adaptability by...
the learner when faced with real problems in the real world. At yet another level, simulation and performance simulation may be necessary for tasks that require higher skill levels.

Technology based training may offer a solution to some of these transfer problems. If we build our technology delivery systems in such a way that they follow good practice, paying attention to the psychology of learning, we have a way of solving this all too familiar problem in education and training.

**Stop the courses! I want to get off**

In 1970, Peter Honey, of learning styles fame, wrote an article with the title 'Stop the courses! I want to get off'. He obviously touched a nerve as it was the only article, he claims, which produced poison pen letters from trainers! Some people were furious that he had the temerity to question the professional practice of the training profession.

Among his tongue-in-cheek suggestions were: courses to be banned for a year; trainers to be given nine months to come up with an alternative, organisations to be fined for running courses, electric shocks for uttering the word 'course'. His poison pen correspondents had failed to see this tongue-in-cheek side of the article. However, the body of the article was well argued and is as applicable today as it was all those years ago.

He felt that training had lost its way. The stand-up classroom course was, he thought, the universal currency of the profession despite the fact that there is little basis in the psychology of learning for this approach. The course obsession, he argued, had led to the cosily tucked away country-houses where course-bound trainers became trapped in patterns of behaviour that are bad for them and bad for learners.

If the aim is to effect significant behavioural change in learners then, he states, these behaviours must survive. Courses are rather impotent here as they are inescapably artificial.
This artificiality is a problem. Observed changes of behaviour on a course are only a training triumph, not a triumph for the individual and organisation in any lasting sense. He doesn’t pull any punches in claiming that trainers are voluntarily condemning themselves to an ever-decreasing role in learning. Courses may do a lot for a trainer’s ego but this leads to arrogance, complacency and a real gap between reality and the trainer’s often idiosyncratic presentation of reality.

**Immediacy**

On-demand e-learning closes the gap between learning and the application of learning. You are not subject to the tyranny of the timetabled course. The learning is available at any time and can be driven by real events. That course on doing appraisals can be done just prior to your first appraisal. The immediate application of knowledge reinforces the learning and is more likely to be retained by being pushed into long-term memory.

**Simulations and transfer**

One way in which we can increase the transfer of knowledge and skills to the real world is to move towards learning strategies in e-learning that allow the learner to learn by doing. A move towards problem-based, task-based, experiential learning closes the transfer gap.

A whole range of simulations are possible, where the user can learn by trying things out, making mistakes and, having corrected those mistakes, move on with confidence and competence.

There is the additional advantage in simulations in that risks are eliminated. You can kill people as a doctor, crash an aeroplane as a pilot, cause a radiation leak as a nuclear power station operator or shoot people as a soldier.

Simulations and case-led learning need to be able to mimic the real world. There are two dimensions to this matching reality;
1. Physical fidelity

Physical fidelity means representing the world as it really appears. For example, staff may need to be seen in the uniform or the setting may need to look like a real branch in a bank. These visual cues are important. They help the learner to integrate learning into their own known structures, they also help transfer that knowledge when it comes to doing the task for real.

2. Psychological fidelity

In many cases this is more important than real world fidelity. To match what goes on in the heads of the customer, the sales person is the key to successful transfer. Learning experiences that don’t match the actual experiences of the learner will fail as there will be a cognitive dissonance between what they learnt and what actually happens when they are faced with customers in the real world.

- The artificiality of offsite courses leads to poor transfer
- Re-entry problems prevent transfer
- Transfer is effective when we learn by doing
- Physical fidelity through visual cues helps transfer
- Psychological fidelity through design helps

the psychology of learning / transfer
The psychology of learning pushes us towards a re-evaluation of learning practice. We have seen how the dominance of the ‘tell’ mode of classroom training can be added to, and improved by, a more sophisticated form of e-learning delivery. This includes: prerequisite analysis, more attention paid to motivation, higher levels of cognitive engagement, avoidance of cognitive overload, better appreciation of how we react to media, a more distributed model of learning, increased reinforcement and improved transfer to real tasks. On top of this we have the possibility of learning more effectively and faster. The productivity gains from these improvements are enormous, improvements that no organisation can afford to ignore.

1. Do learners learn more using computer-based instruction than they do with conventional ways of teaching, as measured by higher post-treatment test scores?

Yes. Learning is more effective than conventional teaching as participation increases retention. Self-paced learning and quality of media also increase effectiveness.

2. When faced with learning the same things as learners using other approaches, do learners using computer-based instruction generally do so in less time?

Yes. Learning is faster than conventional teaching, typically 30%-60% faster as presentation time is compressed and self-paced learning is faster learning.
3. On prerequisites, can e-learning solve the problem of getting the right learning to the right people at the right time?

Prerequisites can be better handled with e-learning as e-learning can be tailored to an individual’s needs and ongoing learning needs can be better measured.

4. What motivates learners and what motivational techniques can be used with e-learning?

Research in the psychology of learning shows that motivation must be relevant to the individual, be about goal setting, self-observation, self-judgement, self-checking, control and autonomy. Motivation is learner-centric, not trainer-centric.

Drop out rates indicate motivational problems in e-learning. However, learners disengage in the classroom but it’s not as visible. Motivational obstacles include: classroom model has been reinforced as primary delivery channel, classroom seen as synonymous with training, training seen as a reward.

Motivation techniques to overcome these obstacles include: brand the e-learning initiative, pre-launch activity, CEO or senior manager support, cascaded emails, compulsion, maximise accessibility, make it matter to the individual’s personal development, certificates on completion, rewards such as prizes or draws, make rewards such as classroom courses dependent on e-learning completion, include peer collaboration and therefore peer pressure, realtime events.

5. Does increased cognitive engagement in e-learning increase retention?

Cognitive engagement in e-learning is personal, in the classroom it is rarely personal. E-learning provides more interactivity than conventional training but organised material, context, interrelationships and familiarity matter.

Encourage the generation of material by the learner, relate to individual, use primacy and
recency to good effect. Relevant imagery, note taking, generating summaries and generating analogies all increase retention.

6. Why is cognitive overload counterproductive in e-learning?

The ‘redundancy effect’ is the result of cognitive overload for the learner; more content can mean less learning. SME pressure to add information is often counterproductive so make SMEs aware of redundancy effect. Simplicity is a virtue and less is more.

7. Should learning be distributed or massed?

Spaced practice avoids fatigue and increases retention. In short, little and often is better as acquisition and retention are both improved.

8. How do our measured responses to media affect learning?

The more a media technology is consistent with social and physical rules, the more enjoyable the technology is to use. Conforming to human expectations means giving people feelings of accomplishment, competence and empowerment. People like to be praised by other people, even when that praise is undeserved, and people like computers that flatter them.

9. How should memory theory influence the way we reinforce for retention?

80% of knowledge is lost within a month. This leaves a potential 400% productivity gain. The sheep-dip experience does NOT reinforce but on-demand e-learning allows immediate reinforcement in the workplace, repetition and therefore reinforcement, and networks can be used to push reinforcement to the learner.

10. Does e-learning help to transfer learning into real results in the workplace?

The artificiality of offsite courses leads to poor transfer; re-entry problems prevent transfer; physical fidelity through visual cues and psychological fidelity through design helps transfer. The immediacy of e-learning also
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