

# “Brain Glue”

## The best and worst strategies for making your training stick!

A summary of John Dunlosky’s, (Kent State University, USA, Professor of Psychology) 2013 paper on effective student learning.

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### 1. Executive Summary

Dunlosky et al. (2013), recently published the following article exploring effective student learning and review techniques that many believe enhance learning experiences, <http://elephantsdontforget.com/wp-content/uploads/2013/05/Learning-White-Paper.pdf>. There are direct parallels between higher education student learning and employee learning in the workplace. (Ignore for now the learning of mechanical skills like driving, using software or operating machinery). We look at what lessons can be learned.

#### **This is an important issue for all L&D professionals to consider because:**

1. Hermann Ebbinghaus (1850-1909) demonstrated that as much as 80% of what we are taught is forgotten within 30 days.
2. According to the recent CIPD/Cornerstone survey more companies are relying on e-learning as a mechanism for transferring knowledge, particularly in relation to regulation and compliance.
3. The consequences of employees not retaining this knowledge could potentially have catastrophic effects for employees and employers.

This short paper will give you a unique insight into how you can support your employees in ensuring that what you train them is retained rather than promptly forgotten and thereby significantly improve the ROI of your current training strategies whilst also improving your enterprise compliance.

The results in the table below shocked us all because some of the ‘old faithful’ techniques that we have all probably relied upon are proven to be, frankly, pretty useless! Think back to when you last had to learn something for an exam or some recent training that you have participated in. Think about the strategies you deployed to ensure what you were taught was retained by your brain and then reference the results table below to see if there was a better alternative.

Effectiveness	Method
High Effective	<ul style="list-style-type: none"><li>• Practice Testing</li><li>• Distributed Learning</li></ul>
Moderate Effectiveness	<ul style="list-style-type: none"><li>• Elaborate Interrogation</li><li>• Self-Explanation</li><li>• Interleaved Practice</li></ul>
Low Effectiveness	<ul style="list-style-type: none"><li>• Summarisation</li><li>• Highlighting/Underlining</li><li>• Keyword mnemonic</li><li>• Imagery for Test</li><li>• Re-Reading</li></ul>

*Table 1. The Results*

Probably the biggest shock was quite how *ineffective* Highlighting/Underlining and Re-reading are! Who doesn’t deploy these strategies when revising? Read on to learn about how the individual strategies are explored in more detail and understand better perhaps why some of the very most effective strategies have NOT until very recently been commonly used.



## 2. About Dunlosky's Review

Despite the fact that psychologists have been developing and evaluating learning techniques for many decades, there is little guidance available in relation to which learning techniques are the most effective for improving learning outcomes. This leads students and employees to often implement ineffective studying strategies.

In an attempt to address this problem Dunlosky explored the effectiveness of 10 learning techniques that could be used by students to enhance their learning in a number of domains. The 10 techniques (see table 2 for a list and brief, albeit quite technical description of each technique) reviewed included some of the most commonly used by students as well as others that previous research has suggested to be particularly effective in improving student success. It is possible to deploy any/all of these techniques in the workplace.

The techniques chosen for the review were all ones that can be used by students/employees with relative ease without requiring the assistance of advanced/specialised technology or extensive materials that would need to be prepared by a teacher. Thus, with the exception of a small amount of training, all the techniques reviewed can be utilised by any student without supervision.

## 3. Reviewing the Learning Techniques

<b>Technique</b>	<b>Description</b>
1. Elaborative interrogation	Generating an explanation for why an explicitly stated fact or concept is true
2. Self-explanation	Explaining how new information is related to known information, or explaining steps taken during problem solving
3. Summarization	Writing summaries (of various lengths) of to-be-learned texts
4. Highlighting or underlining	Marking potentially important portions of to-be-learned materials while reading
5. Keyword mnemonic	Using keywords and mental imagery to associate verbal materials
6. Imagery for text	Attempting to form mental images of text materials while reading or listening
7. Rereading	Restudying text material again after an initial reading
8. Practice testing	Self-testing or taking practice tests over to-be-learned material
9. Distributed practice	Implementing a schedule of practice that spreads out study activities over time
10. Interleaved practice	Implementing a schedule of practice that mixes different kinds of problems, or a schedule of study that mixes different kinds of material, within a single study session

*Table 2: List and description of the learning techniques to be reviewed*

Techniques are considered high in effective terms when the effects are strong and are likely to be appropriate across a number of situations. Techniques may be labelled as moderate or low effectiveness for a number of reasons, for example, the technique may only be useful or adopted in some situations, but, relative to the other techniques, it would be considered low in effectiveness because of its limited generalizability. A technique could also receive a low- or moderate-utility rating if there is, as yet, insufficient evidence to support a higher utility assessment. In Appendix 1 we have listed a summary of the findings of each of the techniques listed in Table 2.

## 4. Conclusion

Students leave education and become employees and it is therefore completely reasonable to assume that they will continue to learn as an employee as they have conditioned themselves to learn as a student.

The trouble is that Dunlosky proves that many of the techniques favoured by students are actually rather ineffective at embedding student learning and it follows that the same techniques will perform equally poorly in the workplace.



Students use these techniques for a variety of reasons, possibly favouring those strategies/techniques that are easiest to access. Highlighting/Underlining and Re-reading would form a key part of most if not all student/employee learning strategies, but unfortunately they don't work very well! Students would be better off spending less time using a more effective technique.

One possible reason for the fact that less students and very few employees participate in Practice Testing may well be because whilst it requires no specific skills it does require a high degree of self-discipline and is likely to be most effective spread over a longer period of time as evidenced by the effectiveness of Distributed Learning. A student or an employee would therefore have to embark upon a deliberate long-term strategy of Distributed Learning and Self-Testing to optimise their learning and keep the content sufficiently fresh and engaging so as not to get bored and give up!

Evidence from the workplace would indicate that the majority of employees simply do not have the time and face too many 'real work' distractions to pursue this strategy and are therefore doomed to opting for one or more of the much less effective strategies.

## 5. New Solution

At [Elephants don't forget](http://www.elephantsdontforget.com), [www.elephantsdontforget.com](http://www.elephantsdontforget.com), working with a team from Aston Business School, we recognised and proved that Distributed Learning and Self-Testing were hugely effective strategies for embedding employee workplace knowledge/learning. It is most satisfying to see such an eminent academic substantiates our findings in this way.

We also recognised that boredom and time poverty were the enemies of effective workplace learning and knowledge optimisation so we concentrated on developing an application that employees found engaging and that took very little time from their working day.

"Nelly" is the result and you can meet her and hear about the great work she is doing in helping employees retain the knowledge that they need to be brilliant in their role and comply with all the relevant legislation impacting their employer.

We hope you found this free paper interesting and that in some way it helps you to improve the effectiveness of the L&D activity in your business.



## Appendix 1

### The Ineffective Ones

#### 1. **Summarization**

Students are often required to learn large amounts of material and summarization is a technique that involves having students write summaries identifying the main points of a text and capturing the gist of it while excluding unimportant or repetitive material. Summarization may boost learning and retention because it involves attending to and extracting the higher-level meaning of the material.

#### 2. **Highlighting and Underlining**

This is one of the most common techniques used by students and this may be due to the fact it is simple, does not require training or the investment of much time beyond what is already required for reading the material. One explanation for the use of highlighting, points to the 'isolation effect' whereby highlighted or underlined text will be more easily remembered as it is separated from the rest of the text. The reality is that highlighting does little to boost performance in tests and in fact in some circumstances it may actually hurt performance!

#### 3. **The keyword mnemonic**

This strategy was originally developed for learning new languages or vocabulary and involves the learner making a connection between a new word and an image involving a related word that serves as a "key" to remember the new word. The technique has been developed to work with many kinds of material. The downsides of this technique were that it may not produce long-lasting results and it wasn't clear whether students would benefit from the technique when they have to generate the keywords themselves.

#### 4. **Imagery use for text learning**

This technique involves mentally imagining the content of each paragraph of text using simple and clear mental images. Developing such images can enhance one's mental organisation or integration of information in the text. It was felt that this technique was only really effective when using text material that was imagery-friendly.

#### 5. **Rereading**

Another technique which is commonly used by students is the rereading of material, whether it is an entire chapter, or just sections. Theoretically it has been suggested that rereading may simply increase the total amount of information encoded, whilst others claim that it increases understanding of the main ideas of the text. Although there are benefits to rereading text material its benefits in other contexts is not well documented.

### The Moderately Effective Ones

#### 6. **Self-Explanation**

The core component of self-explanation involves having students explain some aspect of their processing during learning. Similar to elaborative interrogation, self-explanation may enhance learning by supporting the integration of new information with existing prior knowledge. This technique has been shown to be effective over wide age ranges and to have effects on a large range of learning outcomes, including various measures of memory, comprehension, and transfer. It was however marked down because it was believed that the effectiveness could be linked to a learner's knowledge or ability level.

## 7. Elaborative Interrogation

Elaborative interrogation (EI) is concerned with asking 'why'. Humans have a natural tendency to be inquisitive and ask questions. Elaborative interrogation is a technique which attempts to capitalise on this inherent drive for understanding and there is much evidence to suggest that explanatory questioning can promote learning. It is a simple strategy that involves, for example, reading a fact and asking 'Why would that be true' and then trying to generate or find out the answer. The explanation for why this technique is successful is that elaborative interrogation enhances learning by supporting the integration of new information with existing prior knowledge. Interestingly research suggests that the answers generated to the why questions are not important as long as they are reasonable.

## 8. Interleaved practice

The vast majority of students will be required to learn content from many different subtopics or problems of many different kinds. In trying to learn lots of different material a common approach involves *blocking*. Blocking comprises studying all content from one subtopic or all problems of one type before the moving on to the next set of material. In contrast, *interleaved practice*, involves students alternating their practice of different kinds of items or problems. One reason why interleaved practice may be beneficial is that it allows students to more readily compare different kinds of problems. Another possible explanation is based on the retrieval from long-term memory that is afforded by interleaved practice. Whilst effective, it was felt that a lot more work was required to better understand the effects and which situations it would best suit.

## The Highly Effective Ones

## 9. Practice Testing

Practice testing involves completing a test as a practice activity and could involve practicing recall of target information via the use of actual or virtual flashcards, completing practice problems or questions included at the end of textbook chapters, or completing practice tests included in the electronic supplemental materials that increasingly accompany textbooks. Practice testing may make it easy to retrieve subsequent information and may also enhance how well students mentally process and organize information. Practice testing has been shown to have a positive effect across a range of contexts and it is a technique that is not particularly time intensive and requires little training.

## 10. Distributed Practice

Whilst cramming before a test is commonplace among students it is generally acknowledged that distributing learning over time (either within a single study session or across sessions) typically benefits long-term retention more than massing learning opportunities in close succession. Distributed-practice effects may occur because the processing of material during a second learning opportunity suffers when it is close in time to the original learning episode. Basically, students do not have to work very hard to reread notes or retrieve something from memory when they have just completed this same activity, and furthermore, they may be misled by the ease of this second task and think they know the material better than they really do. Others suggest that the second learning opportunity may be more effective once the initial learning has been consolidated. It is a technique that works across students of different ages, with a wide variety of materials, on the majority of measures, and over long delays.