Interleaving table

Retrieval and interleaving

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Mastering interleaving

This guide is a comprehensive resource for implementing interleaving in your learning system. At the top, you will find examples of interleaving techniques for you to use and adapt. At the bottom, there are more notes on general guidelines and frequently asked questions.

Useless techniques

These techniques offer so little benefit that they should not be used in any circumstances. There are always better alternatives for the same amount of time.

Declarative-focused	Procedural-focused
Passive re-reading and re-writing	Re-reading and re-rewriting notes
Passive re-listening	REBIM
Practice questions (passive method)	
Peer/group discussion (undirected)	

Explanations

- Passive re-reading, re-writing, and re-listening
- REBIM (Repetitive Execution Beyond Initial Mastery)
- Practice questions (passive method)
- Peer/group discussion (undirected)

Declarative-focused techniques

Note that some of the techniques are suitable for multiple orders of learning. These techniques are marked with an asterisk (*).

- About declarative knowledge types
- Characteristics of declarative knowledge
- Examples of declarative-focused disciplines and subjects

Knowledge mastery (order of learning)	Techniques
Lower-order (Best for direct fact recall and detail memorisation)	• 3Cs • Flashcards (simple) • Brain dump (linear) • Generated questions (isolated) • Teaching (isolated) • Feynman method* • Method of loci or our Modified Method of Loci • Story/link method • Ben system
Mid-order (Best for knowledge application, basic problem solving, and obvious relationships)	• Flashcards (simple relational) • Brain dump (mindmap)* • Generated questions (simple relational or multi-relational) • Teaching (simple relational) • Practice questions (direct method and advanced group method*) • Feynman method*

Knowledge mastery (order of learning)	Techniques
Higher-order (Best for discussions and complex problem-solving where multiple concepts affect each other)	• Chunkmaps • Flashcards (evaluative) • Brain dump (mindmap)* • Generated questions (evaluative) • Teaching (Modified WPW) • Peer/Group discussion (evaluative) • Practice questions (extended method and advanced group method*) • Feynman method*

Explanations

3Cs (Cover, copy, check)

Flashcards (all variations)

Generated questions (all variations)

Isolated

Create your own practice questions. Isolated questions focus on retrieving single facts, concepts and explanations of isolated processes. Many "what" based questions tend to be isolated. The types of questions at this level are ideally served via simple flashcards.

Simple relational and multi-relational

Simple relational questions challenge you to explain or discuss the relationship between **two** related ideas. Multi-relational questions challenge you to retrieve the relationships between **more than two** related ideas. These can be combined as part of *Practice questions - advanced group method.*

Evaluative

Evaluative questions challenge you to discuss relationships between multiple related ideas and conclude on the relationships' strength and importance. A crucial part of evaluative questions is that the learner must make a value judgment on the importance of concepts compared to other concepts. This level of questioning has significantly beneficial learning effects for depth of knowledge and retention.

Because evaluative questions are time-consuming to create, it is recommended to create questions in one session and answer them in another. Creating questions produces retrieval benefits, as does answering them. By splitting the question creation and answering process, we are able to receive two rounds of positive learning effects. One retrieval session also prepares us for the next.

These can be combined as part of *Practice questions - advanced group method.*

Brain dumps (all variations)

Teaching (all variations)

Practice questions (all variations excluding passive)

Peer/group discussion (evaluative)

Chunkmaps (or GRINDEmaps)

Method of loci, link/story method, and Ben system

Feynman method/technique

The advanced group method for practice questions

This interleaving technique is a composite of generated questions, peer/group discussion, and practice questions. It is an involved and extensive retrieval technique but one of the most consistently effective and useful across all declarative-focused subjects.

Instructions

1. Choose a topic.
2. Create a study group with at least 1 other person of a similar knowledge level to you (or higher).
3. Each person creates a practice exam. Ensure to cover some mid-order questions as well as more challenging and nuanced higher-order questions. Strictly lower-order questions can be addressed through other retrieval methods.
4. Create a perfect answer sheet for your exam by first brain dumping to the best of your ability, then reviewing your learning materials to refine and perfect the answers.

5. Swap the practice exams with each other. Hold onto your answer sheet.
6. Answer the exams from memory to the best of your ability.
7. Mark answers where you were uncertain for further review.
8. Create a perfect answer sheet for this practice exam by reviewing your learning materials.
9. Swap answer sheets with each other.
10. Compare your answers against your answer sheet and their answer sheet. Look for differences between your answer sheet and theirs.
11. If there are any points you disagree with wish to explore in more depth, discuss with the other person to arrive at a conclusion.

This method tests multiple orders at multiple perspectives and forces positive generative effects of learning during steps 3, 4, 6, 8, 9, and 10. For each hour of time spent, the amount of learning consolidation and gap-testing is one of the highest out of all retrieval methods.

As this method is time-consuming, we recommend splitting this process over multiple days.

> Due to its high effectiveness **and** efficiency, the advanced group method for practice questions is a method we generally recommend all learners to try and utilise, if possible.

Procedural-focused techniques

Note that some of the techniques are suitable for multiple orders of learning. These techniques are marked with an asterisk (*).

About procedural knowledge types

Characteristics of procedural knowledge

Examples of procedural-focused disciplines and subjects

The relationship between declarative and procedural knowledge

Knowledge mastery (order of learning)	Techniques
Lower-order Best for following the rules of a procedure. For example: • Basic vocabulary • Applying a rule on a formula • Using the correct syntax while coding • Learning a basic function in a coding language • Following data transformation processes	• Retrieved execution (simple) • Simple flashcards • Ben system • Challenges (simple)
Mid-order Best for basic knowledge application. For example: • Basic phrases and predictable conversation in a foreign language • Simple problem-solving • Creating simple applications and functions • Performing straightforward analyses	• Retrieved execution (integrative) • Challenges (integrative) • Variable modification
Higher-order Best for challenging applications. For example: • Unpredictable conversations in a foreign language • Complex problem-solving in unfamiliar contexts • Creating advanced functionality and applications • Performing a series of related analyses and data transformations	• Retrieved execution (applied) • Challenges (edge-case) • Variable addition

Explanations

Ben system and simple flashcards

Retrieved execution (all variations)

Challenges (all variations)

Variable modification or addition

Example combinations

Combination for mostly procedural knowledge

Combination for mostly declarative knowledge

Combination for mixed knowledge types

FAQs

Should I type or write out answers to questions?

Do I need to write out answers in full for practice questions?

Do I need to teach out loud if using teaching methods?

What if I go out of scope of my curriculum?

How accurately do I need to space out sessions?

What if I don't have enough time for all these sessions?

For foreign language learning, I heard that I shouldn't try to speak or write anything until I feel liked I have mastered it already.