Effective Study Strategies Exercises
in Online or Blended Delivery

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Target education level: First-year university and high school.

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# Evidence-Based Teaching Strategies in this Resource

The teaching strategy is itself sharing with students a review of evidence-based study strategies (Dunlosky et al., 2013), published in one of the most reputable psychological science journals. It does so in an active and student-centred way (thus drawing on evidence for the effectiveness of active learning; Freeman et al., 2014; Shu et al., 2020). This section utilises Worrell et al.’s (2010; see pp. 132-138) *“Promising principles for translating psychological science into teaching and learning”* as one framework for highlighting the evidence-based teaching strategies in this resource.

Desirable Difficulties (“Generally, desirable difficulties stimulate active engagement that would not ordinarily occur, and this supports retention, transfer, or both”; p. 137). Prompting students to generate a research design to test the effectiveness of a particular study strategy (Online Task 2), and inducing cognitive equilibrium/disruption when comparing their own study strategies with those in the paper (Online Task 1; Face-to-Face Homework/Tutorial), include the processes involved in desirable difficulties (see p. 132), and thus should lead to more effective learning and memory.

Deep Explanatory Processing (“Deep explanations foster development of a complex understanding of the topic”; p. 137). Asking students to: (a) analyse their own study strategies in relation to the study strategies described and evaluated (Online Task 1 Part A; Face-to-Face Homework); (b) find a recent article evaluating a study strategy and summarising it (Online Task 3); and (c) generate learning and memory concepts relevant to each of the study strategies (Appendix B); should elicit deep explanatory processing and thus more effective learning and memory.

Organisation Effects (“Organising content can be extremely effective for promoting retention and recall”; p. 137). Asking students to read the article prior to answering questions about it in relation to their own study strategies (Online Task 1 Part A; Face-to-Face Homework), and asking students to generate learning and memory concepts relevant to each of the study strategies (Appendix B), should lead to organisation effects and thus more effective learning and memory.

Spacing and Distributive Learning (“Reviewing key content with delays between repetitions produces positive benefits for long-term retention”; p. 137). The suggested tasks/stages of this teaching strategy are distributed over time, so this should promote both distributive learning effects as well as interleaved learning (Desirable Difficulties), thus leading to more effective learning and memory.

Metacognitive Monitoring (“ ...refers to learners’ assessments of their knowledge levels and ability to remember information on criterial assessments”, p. 138) and Transfer appropriate processing in new contexts (“Maximising performance on summative assessments in an academic course requires that study and learning strategies are appropriate for transfer to the type of assessment selected for the course”, p.137): The point of this teaching strategy is to give students the opportunity to examine their current study strategies in light of the evidence presented by Dunlosky et al. (2013; metacognitive monitoring; Online Task 1, Part A; Face-to-Face Homework/Tutorial), and also to consider whether/how they might improve their study strategies in future new learning contexts (transfer; e.g., Face-to-Face Tutorial).

Teacher and Learner as Holistic Agents: The summary information in Appendix A provides students (and teachers) with reasons why it is worthwhile engaging with these activities. The sections on “How can this information be useful to other instructors?” and “Additional Suggestions” provide teachers with reasons why this teaching strategy is worthwhile and adaptable to different educational contexts.

Finally, the effectiveness of this particular teaching strategy has not been specifically evaluated, however, the units in which it has been delivered have been favourably evaluated (see Morris & Cranney, 2022). We initially introduced the strategy in a flipped classroom unit in 2013, and in 2019 we designed a fully online unit with some of the same material, but based on the textbook, Morris et al. (2018).

# Brief Description of Resource

This resource/strategy requires students to think about what strategies they use to study for exams, and then to expose them to a review of the effectiveness of different study strategies, and then reflect on how that compares to their own strategies. There are additional suggested activities such as designing a study to test the effectiveness of a chosen study strategy. This resource is most suited to first-year university students in *any* discipline (and upper-level high school students), but psychology students should benefit the most. Blended and fully online versions are presented.

# How this Resource is Useful to Instructors and Helps them become Better Teachers

In almost any unit in almost any discipline/profession, this strategy can be introduced in lectures, tutorials and/or laboratories, but would be particularly useful in the first year of university/college/senior high school, in the second or third week of the semester or term (not during the first week of overload), and preferably at least two weeks before a serious examination. The strategy could also be introduced in extracurricular orientation programs.

Introducing the first component of this activity could have the impact of: (a) assisting students to pass exams, assuming implementation of more effective study strategies; this may also benefit instructors (from an administrative workload perspective); and, (b) creating the impression that the instructor cares that students do well in their unit, which should lead to better engagement and higher student evaluations.

We provide ready-to-use evidence-based material that can be easily adapted to different educational contexts. The resource demonstrates to students that psychological research can have a positive impact on their current lives, and this should increase their motivation to engage with the unit material. Instructors may become better teachers through the experience of adapting this material to their specific context, and hopefully evaluating it (Chew et al., 2011; Gurung, 2021; Worrell et al., 2011).

# Aim/Intended Student Learning Outcome of this Resource

The intended student learning outcome is an understanding of which study strategies are supported by research, and which are not.

# Resource Introduction

This resource pack includes this brief introduction including Tables 1 to 3 (to be copied/adapted), the online presentation version, the flipped classroom version, a References/Resources list, and appendices.

This strategy was initially developed for a flipped classroom unit whereby students undertake weekly online-delivered homework prior to a weekly face-to-face, highly interactive tutorial. The strategy was then converted to an online version of that unit. The implementation of the strategy is described almost exactly as used in those different modes of delivery; instructors should ‘mix and match’ to their local context. The strategy is based on the review by Dunlosky et al. (2013; see also the References/Resources section).

Tables 1 to 3 can be used or adapted by educators to share with students within presentations, handouts, and/or on the learning management system (LMS). The left-hand column of all Tables depicts the study strategies reviewed by Dunlosky et al. (2013). For one idea of how this teaching strategy can work in a blended or flipped classroom environment, see the slides in the separate file. We have also combined the essential information of Tables 1 and 2 into Table 3.

### Table 1. Study Strategies and Descriptions

|  |  |
| --- | --- |
| **STUDY STRATEGY** | **Description\*** |
| Elaborative interrogation | “Generating an explanation for why an explicitly stated fact or concept is true” |
| Self-explanation | “Explaining how new information is related to known information, or explaining steps taken during problem solving” |
| Summarization | “Writing summaries (of various lengths) of to-be-learned texts” |
| Highlighting/underlining | “Marking potentially important portions of to-be-learned materials while reading” |
| Keyword mnemonic | “Using keywords and mental imagery to associate verbal materials” |
| Imagery for text | “Attempting to form mental images of text materials while reading or listening” |
| Rereading | “Restudying text material again after an initial reading” |
| Practice testing | “Self-testing or taking practice tests over to-be-learned material” |
| Distributed practice | “Implementing a schedule of practice that spreads out study activities over time” |
| 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” |

\*Quoted from Dunlosky et al. (2013, p. 6).

### Table 2. Study Strategies: Effectiveness

|  |  |
| --- | --- |
| **STUDY STRATEGY** | **Effectiveness\*** |
| Elaborative interrogation | “Promising, but needs more research” |
| Self-explanation | “Promising, but needs more research” |
| Summarization | “Helpful only with training how to summarize” |
| Highlighting/underlining | “Not particularly helpful, but can be used as a first step toward further study” |
| Keyword mnemonic | “Somewhat helpful for learning languages, but benefits are short-lived” |
| Imagery for text | “Benefits limited to imagery-friendly text, and needs more research” |
| Rereading | “Distributed rereading can be helpful, but time could be better spent using another strategy” |
| Practice testing | “Very effective under a wide array of situations” |
| Distributed practice | “Very effective under a wide array of situations” |
| Interleaved practice | “Promising for math and concept learning, but needs more research” |

\*Quoted from Dunlosky et al. (2013, p. 20).

### Table 3. Study Strategies, Descriptions, and Effectiveness

|  |  |  |
| --- | --- | --- |
| **STUDY STRATEGY** | **Description\*** | **Effectiveness\*\*** |
| Elaborative interrogation | “Generating an explanation for why an explicitly stated fact or concept is true” | “Promising, but needs more research” |
| Self-explanation | “Explaining how new information is related to known information, or explaining steps taken during problem solving” | “Promising, but needs more research” |
| Summarization | “Writing summaries (of various lengths) of to-be-learned texts” | “Helpful only with training how to summarize” |
| Highlighting/underlining | “Marking potentially important portions of to-be-learned materials while reading” | “Not particularly helpful, but can be used as a first step toward further study” |
| Keyword mnemonic | “Using keywords and mental imagery to associate verbal materials” | “Somewhat helpful for learning languages, but benefits are short-lived” |
| Imagery for text | “Attempting to form mental images of text materials while reading or listening” | “Benefits limited to imagery-friendly text, and needs more research” |
| Rereading | “Restudying text material again after an initial reading” | “Distributed rereading can be helpful, but time could be better spent using another strategy” |
| Practice testing | “Self-testing or taking practice tests over to-be-learned material” | “Very effective under a wide array of situations” |
| Distributed practice | “Implementing a schedule of practice that spreads out study activities over time” | “Very effective under a wide array of situations” |
| 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” | “Promising for math and concept learning, but needs more research” |

\*Quoted from Dunlosky et al. (2013, p. 6). \*\* Quoted from Dunlosky et al. (2013, p. 20).

In the instructions for Online and Flipped Classroom implementations in the below sections, occasionally ***suggestions/instructions for the educator are indicated in [square brackets],*** within the instructions to students.

# Online Version

The Task Instructions (see below) would be pasted into the LMS, and the Dunlosky et al. (2014) article would be made available on the LMS (unless the instructor wanted to make it an additional task for students to find the article, if they have adequate literature search skills).

If the instructor either decides not to provide such a reading task, or wanted to summarize the main points prior to the flipped classroom activity, then some summary points for slides would be helpful. These are provided in Appendix A. Alternatively: (a) there are videos that ‘unpack’ the findings, that could be shown in class; and, (b) the instructor could set for reading the student-friendly version of the review article (Dunlosky, 2013; see the References/Resources section).

The instructor may wish to tie this activity to learning and memory (L&M) concepts, either by introducing the activity after those concepts have been covered, or by instigating an additional stage of this strategy after the L&M content has been covered. Please see Appendix B for some suggestions

Note that the assessable aspect of Task 1 does not include whether or how they read the article; rather, what is assessable is the response to the Parts A and B (below). Students would be told that they need to undertake the tasks by a certain deadline (here, it is the end of Week 4, after being given the task at the beginning of Week 3). Completing the tasks successfully yields a small percentage of marks toward the final grade. Some reference is made to the textbook (The Rubber Brain; Morris et al., 2018) for this unit; adapt wording as necessary.

“**Task 1: Study Strategies (Part A should be done ASAP)**

With reference to Chapter 7 in The Rubber Brain (Morris et al., 2018, pp.175–176), and Tables 1 and 2 [place these on the LMS] adapted from Dunlosky et al. (2013), showing which two of many study strategies have strong evidence for effectiveness:

***Part A:* START** a new **discussion forum post** answering these questions (number each answer):

1. What study strategies do **you** routinely use for exams?
2. Do you think that the marks that you have received in the recent past reflect the effectiveness of your strategies (i.e., do you think your strategies are effective)? Why/why not?
3. How do Dunlosky et al.'s (2013) findings relate (or not) to your own study experience/habits?

**Each student should create a new discussion post/thread for their response.**

***Part B:*** Once you have submitted your post, find ONE other student who uses the same (or similar) strategy as you. **Reply** to their post to indicate which strategy you share.

Note: to complete this task, you will need to START one post **and** REPLY to one post.”

Example low-stakes marking rubric, worth 2 marks:

1. 0.5 mark for listing of study strategies.
2. 0.5 mark for reasons given, if these make sense.
3. 0.5 mark if *clear* relationship is made between student’s study strategies and Dunlosky et al.’s findings.
4. 0.5 mark if Part B is enacted.

**Task 2: Design a Study**

Design a study to test ONE of the study strategies that someone (not you) has posted on the Study Strategies forum. Ensure you specify: a hypothesis (that it does affect behaviour/performance); the independent and dependent variables; and some key aspects of the procedure, including how you would operationalise your variables. Indicate what pattern of results would support your hypothesis. Write between 100 and 250 words.

Your response will be private to the marker.”

The student’s study design would be marked by the instructor using a rubric\* that includes the aspects listed above. However, this should not be a high-weight assessment task, so instructors should ensure this is not an enormous amount of marking work.

An example of a simple marking rubric for a total of 3 marks:

Directional hypothesis, IV, and DV:

1 mark if these three elements are mentioned: IV, DV, direction.
0.5 marks if it contains two of these three elements.
0 marks if it contains only one or none of the three elements.

Procedure:

2 marks if these 4 elements are mentioned (each worth 0.5 marks):
– feasible operationalisation of IV;
– feasible operationalisation of DV;
– a procedure that validly tests the hypothesis;
– description of any additional useful aspect of the procedure (e.g., obtaining informed consent).

Instructors could consider whether an additional task would be to comment upon the methodology of another student’s study design.

If students have not yet been adequately exposed to the basics of research methodology, the instructor may wish to drop the ‘design a study’ component of the strategy, or introduce an additional stage of this strategy after basic research methods content has been covered.

**Task 3: Find and Summarise a Paper**

The learning objectives of this task are: (a) have students practice literature search skills which they would have already been introduced to (if not, this is a perfect opportunity to work with the university/college library to do so); and, (b) practice paraphrasing at least the abstract of the paper in their own words. These skills are essential starting points to understanding the nature of research. The following instructions would be posted on the LMS:

“Find one peer reviewed journal article (not one that has already been posted in the forum, first-in first-served) published in the last 5 years that evaluates one or more study strategies. Post a summary of the article in this forum (click “ADD A NEW DISCUSSION”; minimum 100 words is required; we suggest a maximum of 250 words), and **attach a copy of the paper itself**.”

For guidance on how to summarise a peer-reviewed article in psychological science, the instructor could share the following link on the LMS: <https://psych.uw.edu/storage/writing_center/summarizing.pdf> (Psychology Writing Center, 2010).

Again, this is a low-stakes assessment, with a simple rubric (with associated low-demand marking load for the instructor). Here is an example of such a rubric for a total of 4 marks:

Article:
1 mark for including a peer reviewed journal article that evaluates one or more student strategies.

Summary:

3 marks if includes mention of these 6 elements (each worth 0.5 marks):

* + - directional hypothesis including mention of IV and DV;
		- description of IV; description of DV;
		- description of procedure; description of results;
		- any additional useful aspect of the article (e.g., rationale for hypothesis, limitations).

Give zero if does not meet minimum word requirement.

# Face-to-face Blended/Flipped Version

This mode of delivery can involve a pre-tutorial/lab homework task (which is assessable—small percentage), and then a face-to-face interaction in that tutorial/lab (see the generic slides in the separate PowerPoint file). See the previous Online Version section for suggested alternative options available to instructors to suit their particular teaching context.

Homework preparatory task:

1. Reading: **Dunlosky et al. (2013)**: Students are asked to read: (a) the review of study strategies (pp. 4–6) (this includes the equivalent of this Table 1); (b) the closing remarks including Table 4 (this includes the equivalent of this Table 2); and (c) sections 8 and 9 (scan only). Alternatively or additionally, students could be asked to watch one of the videos listed in the References/Resources section. Then students are asked:
2. “Write a list of ALL the study strategies that you use. Indicate which of these have been discussed in the article, referring to Table 1 in Dunlosky et al. (2013) [equivalent of this Table 1]. Submit to the Learning Management System, and bring one copy to class—hand in after discussion.”

Instructors can simply mark #2: 0.5 mark for the list of study strategies; 0.5 mark for marching at least one of these to Dunlosky et al’s Table 1.

In face-to-face tutorial/lab:

1. Show Table 1 (see the generic slides in the separate PowerPoint file).
2. 10-min exercise—show this slide:

“In groups of 5-6 (5 min):

* Each person describe ONE study strategy they use
* Was the strategy mentioned in the review?
* If so, was it found to be effective?
* If not, why do you think that is the case?
* Out of this discussion, choose one point to feed back to the class

FEEDBACK to CLASS (5 min)”

1. Show Table 2, just to remind them of the outcomes of the review.
2. Study Strategies Design (25 min): Show slide:

Note that as in the ‘Online Version’ section above, if students have not received an introduction to research methodology skills, then instructors should drop this aspect or return to it after students have had such instruction.

“In same groups:

* Choose one strategy which either was NOT mentioned in the review, OR that had insufficient evidence. How would you go about designing a study to test the effectiveness of that strategy? (10 min)

Don’t forget: hypothesis, IVs, DVs, and feasibility regarding ethics and resources

FEEDBACK to CLASS (5–15 min)”

Note that there may not be time for discussion of more than a couple of the groups’ designs. Encourage other students to comment on those designs (i.e., strengths, weaknesses).

1. Show a slide with this information, allow 5 min for general class discussion:

“The review indicates no strong evidence that highlighting/underlining, and summarizing assist academic performance.

* How does this resonate with YOUR experience? Are you an ’outlier’?
* Alternative explanations of lack of strong evidence?
* How does this impact your own judgment of learning?
* If you were working for the university in a student support role, what strategies would you advise students to use?
* After class: Reflect on whether you will/will not change some of your study strategies.”

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## Videos

Psychology professor summarising Dunlosky (about 10 min):

<https://www.youtube.com/watch?v=q-IzB64AhIM>

Medical student summarising Dunlosky (each about 20 min):

<https://youtu.be/ukLnPbIffxE>

<https://youtu.be/Z-zNHHpXoMM>

Dunlosky himself (about 50 min):

<https://www.youtube.com/watch?v=7KsC9CktCno>

Here are some engaging videos by Stephen Chew:

<https://www.youtube.com/watch?v=RH95h36NChI>

# Appendices

## Appendix A: Summary Points of Dunlosky (2013) and Dunlosky et al. (2013)

In the descriptions for Online and Flipped classroom delivery, we expect students to read at least the central aspects of the target article (most of our students complete these tasks). If the instructor either did not set such tasks, or wanted to summarize the main points prior to the flipped classroom activity, then some summary points for slides would be helpful. These are provided here. Alternatively (a) there are videos (see Reference/Resources) that ‘unpack’ the findings, that could be shown in class, and (b) the instructor could set for reading, the ‘student friendly’ version of the review article (Dunlosky, 2013; see the References/Resources section).

1. Aim = evaluate the utility (effectiveness, usefulness, and practicality) of ten learning techniques that students can use.
2. Utility evaluations covered: learning conditions, student characteristics, materials, criterion tasks, effectiveness in educational settings, and issues for implementation.
3. Top two techniques = *practice testing* and *distributed practice*, as they increased learners’ performance across a wide student age range and level of ability, and had positive ratings for the remaining evaluation elements.
4. Three potentially helpful techniques = *elaborative interrogation*, *self-explanation*, and *interleaved practice*, as they support (or are likely to support) deeper learning; however, more research is needed to establish effectiveness in educational contexts specifically.
5. Five techniques with low utility: “summarization, highlighting, … keyword mnemonic, imagery use for text learning, and rereading”; some are only helpful in specific situations, are harder to implement, have limited short-term benefits for retention, require pre-existing or learned skills, or require greater prior knowledge to be effective/easy.
6. Take-home messages/points for students to consider:
* which techniques are effective for most people.
* which techniques are useful for specific purposes.
* which techniques you have the skills for already, or can easily learn.
* which techniques make the best use of your existing knowledge.
* if a technique is ineffective for you (e.g., evidenced by low results on tests), replace it with a different one.
* not all techniques suit everyone, so have a go at different types\*.
1. Take-home messages/points for educators:
* be aware of the most effective techniques overall.
* be aware of which techniques have greater utility for students and are practical to implement.
* check the article (Table 4) to identify whether there are specific learning techniques which are likely to maximise students’ learning given the particular course/material (or, restructure the course/material so that the fit is better).

\*Instructors could indicate to students that “Evidence-based” means that it works for most people most of the time (i.e., is probabilistic not absolute).

## Appendix B: Connecting to Learning and Memory Concepts

The instructor may wish to tie this activity to learning and memory (L&M) concepts, either by introducing the activity after those concepts have been covered, or by instigating an additional stage of this strategy after the L&M content has been covered.

Because of the variability in educational contexts, it is difficult to indicate the best way to introduce students to the L&M mechanisms hypothesised to underly the study strategies outlined in Dunlosky et al. (2013). In Table B1 below, based on Dunlosky et al. and referring to a standard introductory psychology text, we propose L&M mechanisms and concepts relevant to each study strategy. An instructor could revise these proposed terms according to what has been emphasised in the L&M section of their unit, then, in an interactive activity, remind students of the study strategies from the earlier stage of this resource, and have teams of students compete with each other (or alternatively, the class could together brainstorm) to identify the related L&M concepts. Together, the class could also speculate as to why or how and under what circumstances, the strategy could be effective or ineffective, with potential answers provided in the right-most columns of Table B1 (this information could be revealed after discussion, and students could argue the case as to whether and why such answers may be correct/incorrect).

### Table B1. Learning and Memory Concepts relevant to Study Strategies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **STUDY STRATEGY** | **Description\*** | **Memory/Learning Concepts** | **Why/how it is, or should be, effective** | **Why/how it can be ineffective** |
| Elaborative interrogation | “Generating an explanation for why an explicitly stated fact or concept is true” | Schemas, retrieval, level of processing (semantic), spreading activation\*\*\* | Asks *why* a fact is true; involves integrating new with prior knowledge; more effective if comparison is precise rather than general; more effective with higher level of prior knowledge to draw on\*\* | Low level of prior knowledge limits capacity to elaborate\*\* |
| Self-explanation | “Explaining how new information is related to known information, or explaining steps taken during problem solving” | Spreading activation (for specific, not general, prompts); or procedural memory, explicit memory\*\*\* | Asks *how* information is related (i.e., similar but simpler than level of processing required for elaborative interrogation); making the acquisition of cognitive skills verbally explicit, such that both declarative and procedural learning and memory can support that process.\*\*\* | Less effective if other people’s explanations are available while creating a self-explanation\*\* |
| Summarization | “Writing summaries (of various lengths) of to-be-learned texts” | Deep processing involving understanding meaning (as opposed to shallow processing)\*\*\* | Active prioritisation of meaningful elements connected in a logical, yet brief, way; should support retention of the overall gist.\*\*Selective attention promoting improved learning and memory.\*\*\* | Requires ability to distinguish important and relevant information from unimportant/less relevant information\*\* |
| Highlighting/underlining | “Marking potentially important portions of to-be-learned materials while reading” | Isolation effect\*\*Selective attention promoting improved learning and memory \*\*\* | Identifies important and unique items, whether highlighted oneself or reading existing highlights provided by experienced person/author\*\* | Likely requires pre-learned skills to identify important and relevant information\*\*; does not promote identification of links between related concepts/ideas |
| Keyword mnemonic | “Using keywords and mental imagery to associate verbal materials” | Encoding specificity, networks of association, retrieval cues\*\*\* | Consciously associating less well-known information with well-known sounds, images, or words containing a similar element to the original information, facilitating retrieval\*\* | Likely less effective for more abstract information that is not easily associated with concrete nouns\*\* |
| Imagery for text | “Attempting to form mental images of text materials while reading or listening” | Representational modes (words, images, sounds)\*\*\* | Mental imagery more effective than reading for comprehension; mental imagery more effective when listening than reading text.\*\*Information stored in memory using multiple representational modes increases number of retrieval cues.\*\*\* | May be more effective with text-based auditory material which is more concrete or spatially-oriented, than abstract.\*\* |
| Rereading | “Restudying text material again after an initial reading” | Repeated learning trials, rehearsal\*\*, encoding quantity\*\* | Suggested to increase quantity of information encoded in memory; or, first read through permits lower-level understanding of details, second readthrough supports processing of conceptual/main ideas; supports free recall\*\* | May not be effective for recognition tasks (e.g., multiple-choice questions).\*\* |
| Practice testing | “Self-testing or taking practice tests over to-be-learned material” | Retrieval, repetition, free recall, cued recall, inference, recognition, retrieval practice\*\* | May “enhance retention by triggering elaborative retrieval processes” (p. 30) and encoding additional ideas associated with those processes on each occasion.\*\* | Minimal to no effects if practice tests are close together (spaced/ distributed tests are more effective).\*\* |
| Distributed practice | “Implementing a schedule of practice that spreads out study activities over time” | Spacing effect (as opposed to massed practice); lag effect (longer lags can be more effective than shorter lags)\*\* | Likely multiple mechanisms; spacing likely activates retrieval (enhancing memory) and consolidation; lags with a gap of “10–20% of the desired retention interval” (p. 37) may be most helpful. May be more effective when doing deeper/intentional processing.\*\* | May be less effective/ineffective for shallow/incidental processing of information.\*\* |
| 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” | Discriminative contrast, long-term memory versus working memory\*\*, categorisation (prototypes, defining features; basic level, subordinate level)\*\*\* | Instead of learning then being tested (practice) on discrete blocks of material, presenting all learning material first then ensuring the tests require comparison of elements from one block against another increases discriminative contrast accuracy when required to respond to novel, related questions a day later. \*\* | Not as effective as blocked practice for short-term problem-solving (less than one day), which likely relies more on working memory than consolidated longer-term memory.\*\* |

\*Quotes from Dunlosky et al. (2013). \*\*Based on Dunlosky et al. (2013). \*\*\*See Burton et al.’s (2022) introductory psychology textbook, which contains reference details and explanations for these concepts.

## Appendix C: Study Strategies PowerPoint Slides

See separate PowerPoint file which contains study strategies slides.