Study tips for medical students

Examples of evidence based revision strategies

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Studying and revising for exams is a major part of medical school success, yet students do not always receive coaching in how best to learn or revise. Many students begin by using the same techniques that worked for them at school, such as revisiting material and making notes. Research has shown, however, that these techniques alone have a limited impact on long term knowledge retention and academic success.1-4

Successful students use a variety of learning strategies, which include:

- Retrieval practice
- Elaboration
- Concrete examples
- Concept maps and dual coding
- Interleaving.

Retrieval and spaced practice

Successful performance in exams relies on being able to retrieve information from your long term memory. Accessing your long term memory is like rediscovering a path—if you have been down it many times before, the neurological connections are stronger and information is easier to remember.

Retrieval practice helps to build these connections, giving you practice at remembering. The three main ways to build retrieval practice into your study are:

- Spacing your revision of topics
- Practising recall before you revisit your notes
- Using practice questions and preparing flashcards to test your recall.

People tend to study a topic in one block before moving on to the next topic, and this is often how students revise. However, spacing out the revision of a large topic over several weeks can benefit your performance and ability to recall information in the long term.6,9 This is because you have to start each session by retrieving knowledge from the last one. To use this strategy effectively, it is important to plan a revision schedule so you don't run out of time.

Before starting to revise a topic, try to recall as much as you can about it. Only read through your notes and any course material after you have attempted to recall as much as you can. Having to actively think about what you already know can help to identify gaps in your knowledge or understanding, which indicate where you need to focus your revision.

Preparing your own flashcards from memory and then using them to revise is another good method of retrieval practice. You can also use practice questions, papers, or quizzes, checking that your answers are correct. This is also an effective way to incorporate retrieval practice into your revision.10 11

Elaboration, concrete examples, and dual coding

Elaboration involves taking a subject or concept and describing it in as much detail as you can. Asking questions such as “why?” and “how?” helps you to draw out detailed knowledge.

Coming up with concrete examples to demonstrate abstract ideas will also help to make information easier to recall.12 Examples help with the understanding of concepts, rather than factual recall.

Creating concept maps (fig 1) can be a useful way to combine elaboration and concrete examples, as well as link ideas. This helps to develop clinical reasoning and problem solving skills.13 14

Presenting words in a visual format, such as in a concept map, also enhances learning14 through a strategy called dual coding, where you present the same information in two formats — visual and verbal. This strategy is particularly useful when learning medical topics such as anatomy, which require visual diagrams or illustrations as well as words.14

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Mixing things up

Interleaving —also known as “mixing things up”—can be another powerful learning strategy to aid recall of related but separate topics. A common approach many students take is to revise topics by subject, because this is usually the way they are taught or presented in textbooks. For example, within a cardiology module a student might revise heart failure, followed by ischaemic heart disease. However, with interleaving, your revision strategy would entail switching between study of different subject areas that are related in some way. You could revise different conditions that cause breathlessness: heart failure, asthma, and pulmonary embolism. This makes it easier to identify different, but similar, conditions.

Studies have found that interleaving aids long term recall and discrimination between concepts. In one study designed to teach students electrocardiogram interpretation, participants in the group who practised interpreting a mixed series of electrocardiograms scored higher than the group who practised interpreting electrocardiograms that showed similar abnormalities.

Interleaving topics can feel awkward compared with studying one topic thoroughly before moving on to another. However, studies have shown that interleaving is better than other techniques in helping people retain knowledge in the long term.

Box 1: Study tips: Thomas Cranfield, second year medical student, University of Nottingham

Before medical school my approach to studying consisted of cramming during the weeks before exams and coursework deadlines. When I started medical school, I was similarly chaotic: I would write lots of notes during lectures, but I didn’t know how to use them. My first formative exam results reflected my poor study habits.

After researching a range of learning techniques, I changed the way I revised. I created and used flashcards, as well as doing practice multiple choice questions and explaining concepts using concrete examples. I also used elaboration and dual coding techniques to help visualise complex ideas and systems of the body.

When I prepare for lectures, I start by looking at the learning objectives and coming up with a list of questions I would like to find answers to during the lecture. I use these answers and additional information from textbooks to form the basis of my revision flashcards.

One of the hardest but most fruitful techniques I added to my revision was interleaving. I use a timer to limit studying a single topic to 25 minutes before moving on to a different topic —for example, going from cardiovascular to respiratory medicine. Initially, this was difficult but I found that the more I did it the more connections I could see between topics, which helped to reinforce my learning.

As a result of changing my approach to revision, my formative marks almost doubled.

Effective learning requires effort and organisation

Educational studies show the advantages that taking a strategic, organised approach to learning has over cramming facts in a short space of time. Brown and colleagues, in their book Make It Stick: the science of successful learning, write: “We are poor judges of when we are learning well and when we’re not. When the going is harder and slower and it doesn’t feel productive, we are drawn to strategies that feel more fruitful, unaware that the gains from these strategies are often temporary.”

The strategies described in this article might seem challenging, but diversifying your learning strategies and spreading out your revision will benefit you not only in your exams but also in your future role as a doctor and lifelong learner.

Box 2: Learning strategies

- To learn effectively, practise retrieving information by:
  - Spacing things out: revisit topics after you have had time to forget them a little
  - Preparing your own flashcards and using them for revision
  - Using self-testing, quizzes, and practice questions
  - To learn better, elaborate and use concrete examples:
  - Describe an idea with as much detail as possible in your own words
  - Use examples to describe abstract concepts. These examples could be clinical examples or links to patients
  - Use concept maps to make connections within and between topics
  - Use words and pictures together
  - Mix things up to improve long term recall:
  - Studying in blocks is effective for short term recall but less effective than interleaving topics for longer term recall.

Box 3: Further information


The Learning Scientists: www.learningscientists.org

ANKI—a website and app that can help you make your own flashcards: https://apps.ankiweb.net/

Kahoot!—create your own quizzes: https://kahoot.com/

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3 Duntley J, Rawson KA, Marsh EJ, Nathan MT, Wiltshire DT. Improving students’ learning with effective learning techniques: promising directions from cognitive and educational psychology. Psychol Sci Public Interest 2013;14:4-58.
17 Gallagher S, Haynes R. Five study techniques every medical and health professions student should know. 2016. www.youtube.com/watch?v=DMflyEcznpg

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Figure

Potential causes and types of seizure, showing how they are related to each other

Fig 1 Potential causes and types of seizure, showing how they are related to each other