LEARN Physics

How to Study Guide

By Dhananjana Weeraratne

Introduction

Physics can feel like a mountain—especially for students in Years 10 to 12, balancing challenging coursework, extracurriculars, and the pressure of looming exams. But the truth is, anyone can climb this mountain with the right tools and approach. Over the past decade, research into how teenagers learn and remember information has exploded, giving us a much clearer picture of what actually works, and what's just a waste of time. This guide distils the latest science-backed study strategies into practical, actionable steps designed for high school students. Whether you're aiming for top marks, or just want to pass without stress, these methods will help you learn more efficiently, retain information longer, and—maybe most crucially—develop confidence in your own abilities.

Efficient Learning

Learn techniques to maximize your study time and retain information better

Long-Term Retention

Discover methods that help move information from short-term to long-term memory

Confidence Building

Develop trust in your abilities through proven study approaches

About Dananjana

My Study Methods

Hi I am Dhananjana and I am an Engineer and VCE Physics tutor. I do not like blowing my own horn, however I believe it is important for you to know who you are learning – someone who has been where you are and has excelled in studies. You will also go forth knowing that these techniques (especially ones in the 'The Study methods I used' section) have been tested before and yielded real results.

I wasn't particularly smart or gifted growing up, and my school grades were quite average in my younger years. I worked hard though, and there wasn't much else to do apart from studying while growing up. I had a great deal of support from my parents, World-class teachers, and other mentors without whom I wouldn't be where I am today.

One day by chance I came across a small book in the school library that helped me improve dramatically. I cannot recall the name of the book, however it was a small blue book on "how to study". By the time I did my Year 12 exams (London A-Levels), I scored 4 A-Grades and scored 100% in my Physics exam papers. This got me scholarships from top Universities around the World, including NTU (ranked 4th for Engineering worldwide).

I have since worked as a structural engineer, training graduate engineers and tutoring VCE Physics to students in Victoria, Australia.

Since I started tutoring (via Learn Physics) I have been telling my students that the best book they can get their hands on to do well is Physics is not a Physics textbook, but a book on How to Study! Over the years parents of my students have asked me to teach their kids the methods I used to study so well, and here they are!

The study methods I used

Here are 4 of the methods I used myself when I was in high school. Try them out and see if they work for you!

1

Same-Day Review

When you get home after school, study what you had learnt at school on the same day. Yes, this means going over all the subjects of the day. As the content would be fresh in your minds from school, it will be easier to recall. This method helps keep the overall volume of studying to a minimum, and prevents you being overwhelmed. It also prepares you for the next lesson at school, which usually builds up on previously taught content.

2

Focus – Store in Memory – Recall

Learning this method was the most significant game changer for me in terms of studying. I learnt it from a Buddhist Monk, and it is for this very reason that this study guide that holds this information will always be free! Monks have to learn large volumes of texts by heart and be able to recall and use them when needed. Therefore, they know a thing or two about memory. To the best of my recollection, this is how it was taught to me:

We all have good memories, do not think that your memory is poor, or that you can't remember regardless of what marks you have been getting. Think about a time someone scolded you or blamed you. You might find that you can recall the event even though it might have occurred a long time ago. Now think about a time when someone talked to you kindly or lovingly. Again, you might be able to see that the memory has stayed with you regardless of how long ago it was. This goes to show that you have a good memory.

You remember these events due to how well they entered your memory – something that can be replicated via focusing.

Step 1 – Focus – How you take "in" the information is important. Singularly focus on the information at hand, do not concentrate on anything else or be distracted.

Step 2 – Store – Store what you learnt in your memory. There is no known limit to how much information your brain can store. Once information is properly stored inside, they can remain in there forever. Recalling what you just studied with the intention of storing it will help in this step.

Step 3 – Recall – Explain what you just learn to someone else. Explain it so clearly that someone else who has no idea about the topic may understand it. Try it on a friend and see how it goes – You won't nail it the 1st time, but will surely get better with practice.

Try all 3 steps in tandem. When I could not find anyone else to explain content to, I would teach them to an imaginary friend. Focus and study – Store in Memory – then Teach it to someone else. While teaching you may find that you can't remember a piece of information, or seem to not be able to explain it clearly enough. This is a normal part of the process. When this happens, be sure to go back and read or study the missing sections so they are super clear to you. Then try to explain the whole section out again. Keep clearing your doubts and you'll be surprised how well you can teach!

3

Past Exam Papers

In a lot of subjects, exam papers repeat questions from past exams in one form or another. It is important to not only do these questions, but to familiarise yourself with the answers. Study the answers so well that you can score full marks if the same questions are asked again. Doing these papers also helps you get familiar with the formats and the type if questions they ask. Time your past papers to see if you have any trouble with your timings.

4

Make & Share Study Notes

You might think that you are in competition with your class mates, and that helping them will only push you further down in rank. I have found the opposite to the true. I have found that giving always comes back in return, and helping my class mates only improved my understanding of study material. When I shared my notes on subjects I was good at, others shared their notes on other subjects with me, which helped me greatly.

We are all unique and the methods that worked me for me may not be the best ones for you. The following pages contains other science-backed methods of studying effectively. Try them all and pick out the ones that wok best for you. Good luck!

Why "Cramming" Doesn't Work: The Science of Spaced Repetition

One of the most persistent myths among students is that last-minute cramming can save you. Sure, you might scrape by on a test, but the knowledge quickly fades. Scientific studies have shown that learning is much more effective when it's spread out over time—a technique known as "spaced repetition" or "distributed practice" (Indegene, 2023). When you space out your study sessions, your brain has time to consolidate information, moving it from short-term to long-term memory. In fact, researchers have found that students who review material over several days retain up to 200% more than those who study in a single session (Learning Center UNC, 2020).

How to Apply This:

- Break your study into small, focused sessions (20–40 minutes) over multiple days.
- Review notes from class every evening, rather than waiting for the weekend or just before a test.
- Use apps like Anki or Quizlet, which are designed for spaced repetition.
- For each topic, schedule at least three review sessions: the first within 24 hours, the next after 3 days, and another a week later.

Example:

Instead of binge-studying all of Newton's laws in one go, review Newton's First Law today, Second Law tomorrow, and Third Law two days later. Then loop back and review all three the following week.

Why it Works:

Each time you revisit material, your brain "retrieves" it, strengthening the memory trace. This is known as "retrieval practice" and is one of the strongest predictors of academic success (USAHS, 2022).

Mastery Through Practice: Solving Problems as Active Learning

Physics isn't a spectator sport. Reading your textbook or watching lectures can only take you so far. The real breakthroughs come when you actively engage—by solving problems, experimenting, and getting your hands dirty (Brainscape, 2023; Stanford Student Learning, 2024).

How to Apply This:

Read Theory

Begin by understanding the concepts

Try Basic Problems

Apply concepts to simple scenarios

Tackle Challenging Questions

Push yourself with complex applications

Practice Exam Questions

Test yourself with real exam formats

- After reading a section, immediately try related practice problems—even if you struggle.
- Don't shy away from challenging questions. Growth comes from facing what you don't know.
- Use past exam papers to familiarize yourself with the style and difficulty of questions you'll face.

Example:

Let's say you're learning about projectile motion. After covering the theory, grab a set of mixed problems—some basic, some intermediate, some challenging. Explain your steps as you solve them. If you get stuck, try to identify which concept is unclear, then revisit your notes or ask a teacher.

> "Active practice" is the single most important ingredient in gaining proficiency in physics (Stanford Student Learning, 2024).

Why it Works:

Solving a range of problems, especially those that stretch your understanding, builds both conceptual and practical mastery.

Testing Yourself: The Power of Retrieval Practice

Most students spend their study time re-reading notes, underlining, or highlighting. While these methods can help you feel productive, research shows they are far less effective than self-testing (USAHS, 2022). Testing yourself isn't just about checking what you know—it's about making your brain work to recover information, which strengthens memory and understanding.

Less Effective Methods

- Re-reading notes passively
- Highlighting or underlining text
- Simply watching video lectures
- Copying notes without processing

More Effective Methods

- Self-quizzing with flashcards
- Writing from memory
- Teaching concepts to others
- Solving problems without notes

How to Apply This:

01

Close Your Book

After studying a topic, put away all materials

02

Write From Memory

Write down everything you can remember about the topic

03

Self-Quiz

Use flashcards or have a friend ask you questions

04

Problem Solving

Try to solve problems without checking your notes

05

SQ3R Method

Survey, Question, Read, Recite, Review

Example:

After a study session on electricity, cover your notes and write out the key formulas, laws, and a summary in your own words. Then check what you missed and fill in the gaps.

Why it Works:

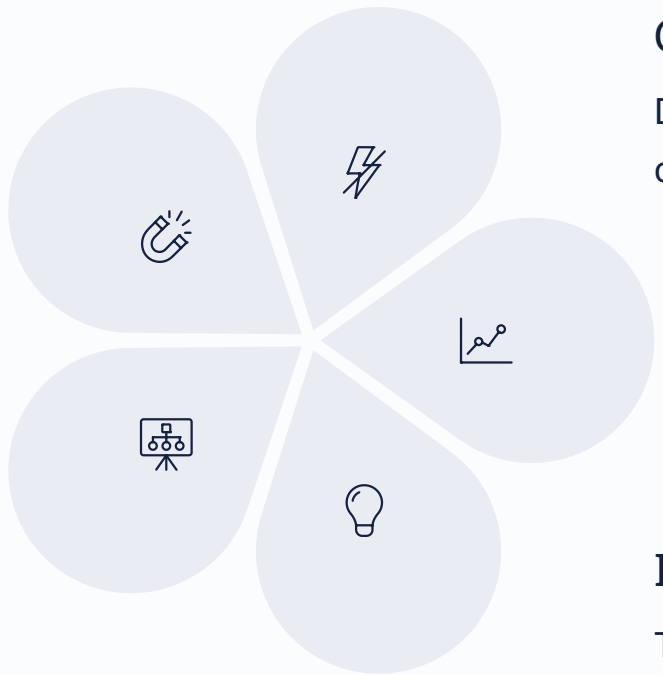
Retrieval practice not only shows you what you know and don't know, but it also makes the knowledge stick. Studies have found that students who regularly self-test outperform those who just re-read material by significant margins (USAHS, 2022).

The Importance of Visuals: Draw, Map, and Diagram

Our brains are wired to process visual information rapidly. In physics, diagrams and sketches are not just helpful—they're essential. Drawing models, graphs, and mind maps helps cement understanding better than simply reading or listening (Scientific American, 2023).

How to Apply This:

- For every new concept, sketch a diagram—even if it's rough.
- Draw force diagrams, circuit layouts, motion graphs, or energy flowcharts.
- Create mind maps to summarize links between concepts.



Force Diagrams

Show all forces acting on objects

Circuit Layouts

Draw complete circuits with components

Motion Graphs

Visualize position, velocity, acceleration

Mind Maps

Connect related physics concepts

Energy Flowcharts

Track energy transformations

Example:

When studying circuits, draw each setup by hand. Label the direction of current, voltage drops, and resistance. For mechanics, sketch every force acting on an object.

> Students who drew information recalled nearly double the amount compared to those who simply wrote notes (Edutopia, 2023; Scientific American, 2023).

Why it Works:

Drawing engages more regions of the brain, making memories stronger and more durable.

Look After Your Brain and Body: Sleep, Nutrition, and Breaks

You can't learn effectively if you're running on empty. Sleep, food, exercise, and stress management are all essential for memory and concentration, especially for teens whose brains are still developing (Embrace U, 2023). Sleep is crucial for consolidating memories, while exercise boosts blood flow and brain function.

Sleep

Aim for 8–10 hours of sleep each night

- Crucial for memory consolidation
- Improves focus and attention
- Enhances problem-solving abilities

Nutrition

Eat regular, balanced meals and stay hydrated

- Provides energy for brain function
- Supports neurotransmitter production
- Maintains stable blood sugar levels

Movement

Take short breaks every hour to move

- Increases blood flow to the brain
- Reduces mental fatigue
- Improves overall cognitive function

Stress Management

Practice relaxation techniques

- Reduces anxiety that blocks learning
- Improves information processing
- Enhances working memory capacity

Example: The Pomodoro Technique

25 min Study

Focus intensely on one topic

5 min Break

Stand up and stretch

Longer Break

After 4 cycles, take 15-30 minutes

25 min Study

Return to focused work

Why it Works:

Studies show that sleep deprivation, poor diet, and high stress all reduce memory performance and focus (Embrace U, 2023).

Make and Stick to a Study Plan

Students who plan their study sessions—rather than "winging it"—are more likely to use their time effectively and less likely to feel overwhelmed (JMU Valley Scholars, 2022).

How to Apply This:

- Write down everything you need to cover for each subject.
- Break big topics into small, manageable chunks.
- Use a planner or calendar (digital or paper) to schedule specific sessions.
- Set goals for each session: e.g., "Solve 5 projectile motion problems," or "Draw and explain energy diagrams."
- Review your plan weekly, adjusting as needed.

Example:

On Sunday, map out your week: Monday—review forces; Tuesday—practice energy problems; Wednesday—watch a video on waves; Thursday—self-test on all topics. Include time for rest and fun.

Why it Works:

Planning gives you a sense of control, reduces anxiety, and ensures you're not neglecting any topics (JMU Valley Scholars, 2022).

Weekly Study Plan Template

Time	Monday	Tuesday	Wednesday	Thursday	Friday
4:00-4:30	Review school notes	Review school notes	Review school notes	Review school notes	Review school notes
4:30-5:15	Physics: Forces	Math problems	Physics: Waves	Chemistry	Physics: Self-test
5:15-5:30	Break	Break	Break	Break	Break
5:30-6:15	English	Physics: Energy	History	Physics: Practice problems	Free choice

Focus on Understanding & Make the Most of Your Support Network

Focus on Understanding, Not Just Memorizing

Physics rewards those who seek understanding over rote memorization. Instead of cramming formulas, try to grasp the underlying principles and see how they connect (Varsity Tutors, 2023).

How to Apply This:

- When learning a new formula, ask: What does each term mean? Why does it make sense physically?
- Link new concepts to things you already know ("Oh, momentum is like mass in motion!").
- Try to predict the outcome of problems before solving them mathematically.
- Ask questions whenever something doesn't make sense.

Example:

Don't just memorize F=ma. Ask: "Why does acceleration increase if force increases? Why does it decrease if mass increases?" Connect it to everyday experiences, like pushing a shopping cart.

Why it Works:

Understanding builds a framework that makes future learning easier and reduces "forgetting curve" effects (Varsity Tutors, 2023).

Make the Most of Your Support Network

You're not alone! Teachers, friends, family, and online communities are all resources. Don't hesitate to ask for help when you hit a wall. Sometimes, a different explanation or a friendly discussion is all it takes for things to click (Stanford Student Learning, 2024).

How to Apply This:

- Form study groups (in person or online) to discuss tricky problems.
- Email or talk to your teacher if you're stuck.
- Use reputable online resources and forums (like Physics Stack Exchange, Khan Academy, or your school's portal).
- Attend extra help sessions or tutoring if available.

Example:

If you're struggling with electricity, ask your teacher for a one-on-one explanation, or post your question (anonymously, if you prefer). If it is a Physics related questions, you can post the question on our free Whatsapp group, and get it answered by fellow students or directly by me. Message me on 040 773 1422 for an invite to the group.

Conclusion

If you have managed to come this far, well done! It is clear that you are willing to improve and are dedicated to your success. Try the methods outlined in this guide and pick out the ones that work well for you. If you would like to share your experience with these methods or have any feedback on this guide please email me: dan@learnphysics.com.au. Good luck with your studies!

Try Different Methods

Find what works best for your learning style

Use Your Support Network

Don't hesitate to ask for help when needed

Stay Dedicated

Consistent effort leads to success

LEARN Physics

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