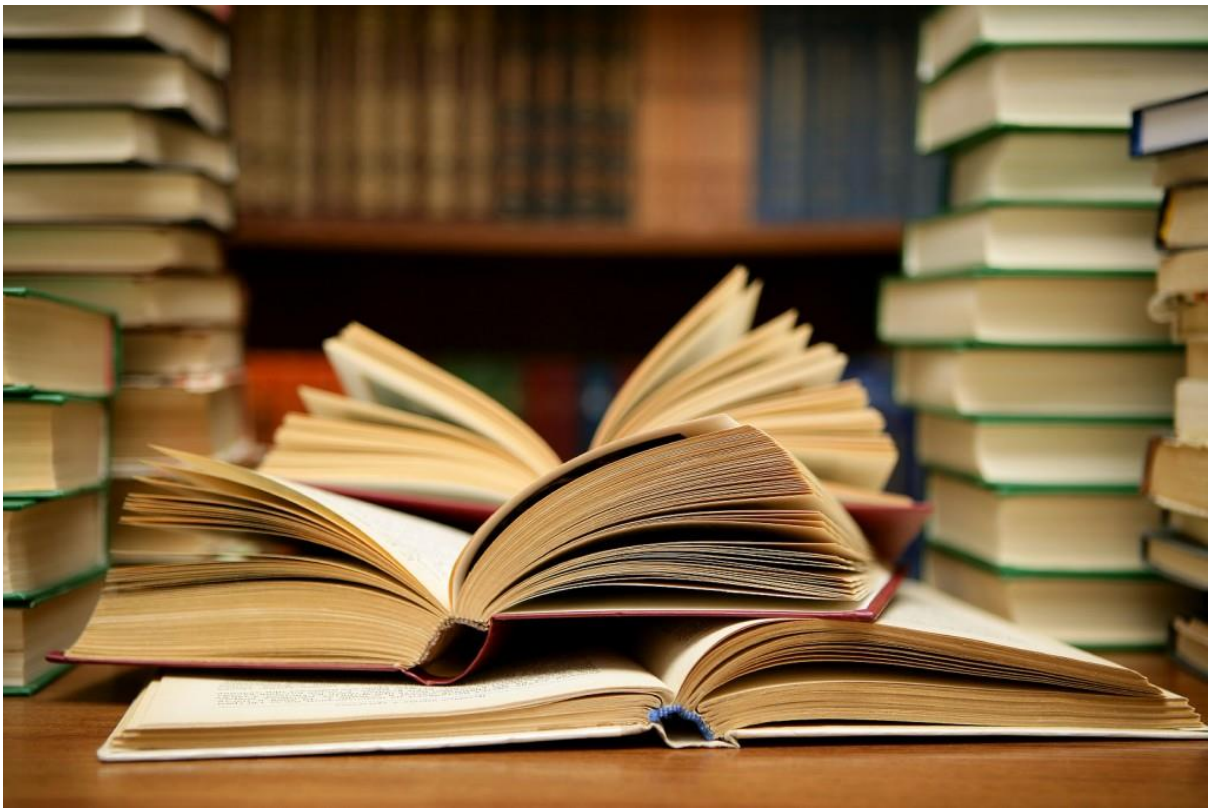
STEM Study Skills



Effective Reading and Research

Introduction

Good Level 3 students read extensively around the subject and beyond the syllabus.

Reading and researching ideas beyond the syllabus helps to underpin ideas taught in lessons, develops greater insights into scientific ideas and technology, and improves engagement and interest in the subject.

In fact, independent reading and research forms a cornerstone of Level 3 study.

Very often, you will be expected to take the initiative and find answers for yourself.

Applying reading and research skills to problem solving is highly transferable – it can be applied in many different scenarios and situations. Being able to demonstrate this will not only benefit your studies but may also have a positive impact on university applications and job interviews.

Three Before Me

Your Level 3 studies – whether A-Level, BTEC, CTEC or any number of other Level 3 qualifications – will help you to become an effective independent learner.

The ability to be a self-motivated learner who knows how to research information and when to ask for help is an important skill that will prepare you for both university study and a multitude of careers.

To help you to develop and perfect this skill, you might like to consider Three Before Me – an idea that you might have come across in high school.

The idea is to apply 3 simple approaches to problem solving before asking for help from a teacher.

1. Brain

Ask yourself, “What do I already know about this topic?” and “How can I apply what I know to this problem/question/assignment?”

2. Book

If you need more information, then it’s time for some **effective reading and research!** Hit the books, websites, magazines or library.

3. Buddy

Still struggling? That’s ok. Ask a friend. Two or three heads are always better than one and maybe together you can work out a solution in collaboration (beware though, some assignments require independent work).

4. Teacher

Have you tried all three of the above and still not got to an answer? OK, now ask a teacher and explain to them what you have tried and learned so far.

The Benefits of Reading

1. Reading Boosts Brain Power

The neuroscientist Donald Hebb is often quoted as saying that, “neurons that fire together wire together” and he was right. The 100 billion neurons of the brain thrive on connecting with each other.

MRI scans have shown that reading involves complex networks and signalling in the brain. The more these circuits are used, the stronger they become. The more you read, the more that network extends and becomes more sophisticated.

2. Reading Boosts Vocabulary

Research has repeatedly shown that students who read regularly develop larger vocabularies than students who read less regularly.

Increased vocabulary has been linked to higher assessment (exam) scores and even better job prospects. Employers are often looking for a candidate’s ability to communicate – communication is easier and more sophisticated if you have more words at your disposal.

3. Reading Reduces Stress

Reading for 30 minutes a day has been found to be as effective as yoga in reducing blood pressure and heart rate, as well as relieving feelings of psychological distress.

When it comes to studying, reading more widely around your subject will also help you to tackle assignments with greater ease and know where to look for information … and this could reduce any stress with meeting deadlines!

4. Reading May Aid Sleep

The Mayo Clinic has found that reading as part of a bedtime routine can help with quality of sleep. Reading books rather than a screen is important here as the light from a screen can “wake up” the brain.

If you are sleeping better, you will be better able to study and learn - both in lessons and in independent work.

5. Reading Could Help You Live Longer!

Well, possibly. Researchers found that people who read for 3.5 hours a week were 23% more likely to live up to 2 years longer who didn’t read at all. We must be careful not to confuse correlation and causation here, but you might think it’s worth a try!

How To Boost Your Reading Power

This is easier than you might think. There is only one thing you need to do…

Read for 30 minutes a day, every day.

That's it. It's that simple. This activity alone will naturally boost your **reading speed**, **vocabulary** and **comprehension**.

And it still leaves 23 hours and 30 minutes to do everything else!

It doesn't really matter what you read, although you will be more motivated if you are interested in what you read.

Here are some suggestions for reading more widely around STEM subjects:

1. New Scientist magazine – a weekly publication available in most newsagents http://www.newscientist.com/
2. Scientific American – monthly magazine available at major newsagents like WHSmith https://www.scientificamerican.com/
3. Science Focus – a magazine published by the BBC and available in many newsagents https://www.sciencefocus.com/

There are many, many more sources of good STEM reading materials and websites – check out the Appendix at the end of this document for lots of highly recommended examples.

And don't forget to browse the bookshelves of your local bookshop for popular science and "smart thinking" titles – there are many to choose from!

Effective Reading and Research

Having established some of the many benefits of reading regularly and recognising that independent research is a key part of Level 3 study, how can you best apply this to college work?

Here are some tips for applying reading and research skills to assignments and independent learning.

- Understand exactly what it is that you are being asked to research. What is the question that needs to be answered? This should guide your reading and research.
- For research work, only use reputable / reliable sources of information (e.g. Royal Society of Chemistry, textbook, etc.) – see the Appendix for lots of good sources of information
- Scan or skim read first - don't waste time reading everything word-for-word initially. Skim first to see if the article/book/chapter contains information relevant to the question you need to answer, then focus in on what is relevant.
- For information research, remain objective. Question what are you reading. Does it sound reasonable? Does the author provide evidence (or references) for what they are saying?
- Don't write anything down that you do not understand and could not explain yourself. Do further research to answer these questions or ask for help.
- Avoid plagiarism - don't copy from the text. Make bullet point notes of the key information or ideas. Then write your answer / assignment by fleshing out your own bullet point notes in your own words.
- Reference your sources. Wherever you have used information from a book, or magazine or website, you must credit the original work by citing it. In the STEM department at the college, we use the Harvard style of referencing. Further information on Harvard style referencing can be found here https://www.citethisforme.com/harvard-referencing. ***This is essential to avoid plagiarism.***

Appendix

Here are some lists of resources across STEM subjects that you might find helpful in your studies.

Chemistry Text Books

A Level Chemistry A for OCR Student Book (Rob Ritchie & Dave Gent) ISBN-13: 978-0198351979

Calculations in AS / A Level Chemistry (Jim Clark) ISBN-13: 978-0582411272
A-Level Chemistry: Essential Maths Skills (CGP A-Level Chemistry) ISBN-13: 978-1782944720

OCR A-level Chemistry Student Guide: Practical Chemistry (Nora Henry) ISBN-13: 978-1471885648

Chemistry Websites

Royal Society of Chemistry: http://www.rsc.org/
Chemguide: https://www.chemguide.co.uk/
Chemrevise: https://chemrevise.org/ocr-revision-guides/
A-level Chemistry: http://www.a-levelchemistry.co.uk/
Khan academy: https://www.khanacademy.org/
Maths & physics tutor (chemistry revision):
https://www.physicsandmathstutor.com/chemistry-revision/

Chemistry Revision Guides

OCR A Level Chemistry A Revision Guide (Rob Ritchie & Emma Poole) ISBN-13: 978-0198351993

OCR AS/A Level Year 1 Chemistry A Workbook: Energy; Core organic chemistry (Mike Smith & John Older) ISBN-13: 978-1471847349

OCR AS/A Level Year 1 Chemistry A Workbook: Foundations in chemistry; Periodic table (Mike Smith & John Older) ISBN-13: 978-1471847332

OCR A-Level Year 2 Chemistry A Workbook: Physical chemistry and transition elements (Mike Smith & John Older) ISBN-13: 978-1471847356

OCR A-Level Year 2 Chemistry A Workbook: Organic Chemistry and Analysis (Mike Smith & John Older) ISBN-13: 978-1471847363

Chemistry – Wider reading

Chemical Principles: The Quest for Insight 5th Edition (Peter Atkins & Loretta Jones) ISBN-13: 978-1429219556

Organic Chemistry (David Klein) ISBN-13: 978-0471756149

Principles of Chemical Science (Catherine Drennan) MITOpenCourseWare
https://ocw.mit.edu/courses/chemistry/5-111sc-principles-of-chemical-science-fall-2014/#

Physics – Textbooks

A Level Physics for OCR Student book (Graham Bone, Nigel Saunders & Gurinder Chadha) ISBN-13: 978-0198352181

Practice in Physics (George Bennet) ISBN-13: 978-1444121254

A-Level Physics: Essential Maths Skills (CGP A-Level Physics) ISBN-13: 978-1782944713

OCR A-Level Physics Student Guide: Practical Physics (Carol Davenport & Graham George) ISBN-13: 978-1471885174

Physics – Websites

Institute of Physics: http://www.iop.org/
A Level Physics Online: https://www.alevelphysicsonline.com/
Maths & physics tutor: https://www.physicsandmathstutor.com/physics-revision/
HyperPhysics: http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
Isaac Physics: https://isaacphysics.org/
Khan academy: https://www.khanacademy.org/
The Physics Classroom: https://www.physicsclassroom.com/
CyberPhysics: https://www.cyberphysics.co.uk/index.html
Physics Tube: http://physicstube.org/

Physics – Revision Guides

OCR A Level Physics A Revision Guide (Graham Bone, Nigel Saunders & Gurinder Chadha) ISBN-13: 978-0198352204

A Level Physics: OCR A Exam Practice Workbook (CGP) ISBN-13: 978-1782949251

Biology – Web Resources

1. Biological Sciences Review. This magazine is written specifically for students of A level Biology, Scottish Higher Biology and first year Biological Sciences undergraduates. It is highly readable and bridges the gap between your text books and scientific journals. There is a charge for subscribing to the magazine. An archive of articles from previous issues can be found on the magazine's website.

2. **Big Picture.** This is a free magazine produced by the Wellcome Trust. It is written for post 16 Biology students and explores the innovations and implications of cutting edge biomedical science. Visit the website to access previous issues.

Recommended web resources

1. Cells Alive. Animations, images and interactives about cell biology. http://www.cellsalive.com

2***. DNA Interactive.*** Video footage and animations that bring our understanding of DNA replication and expression to life. http://www.dnai.org/

3***. Learn.Genetics.*** Animations and interactives that bring genetics, bioscience and health to life. http://learn.genetics.utah.edu/

Biology – Current Research

1. **New Scientist** This is a weekly science magazine that keeps you up to date with what's new in science. If you wish to become a subscriber, you will have to pay, but your school or college may already subscribe. Ask your teacher or learning resource manager. http://www.newscientist.com/
2. **Nature.** This is an international weekly journal of science. http://www.nature.com/
3. **BBC Science and Environment news**. Keep up to date with science and environment news as it happens. http://www.bbc.co.uk/news/science_and_environment or via the BBC News phone App.
4. **BBC Health news.** This provides breaking news from the world of human health and can also be found on the BBC News App. http://www.bbc.co.uk/news/health