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Secrets

of

Academic Success

Timeless Principles for Lifelong Learning

R (Chandra) Chandrasekhar

SwanLotus
to help you learn better

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This book is dedicated to the

HUMBLE STUDENT

within each and every one of us,
who ever thirsts for knowledge,
and who uses that knowledge to serve humanity;

and to all the

EXEMPLARY TEACHERS

who have selflessly illuminated
every stage of learning in our lives.

Epigraph

क्षिप्रं हि मानुषे लोके सिद्धिर्भवति कर्मजा ॥

kṣipraṃ hi mānuṣe loke siddhir bhavati karmajā.

Verily in the world of humans, success is quickly born of action.

श्रीमद् भगवद् गीता ४:१२

Śrīmad Bhagavad Gītā 4:12

கற்க கசடறக் கற்பவை கற்றபின்
நிற்க அதற்கு தக

kaṟka kacaṭaṟak kaṟpavai kaṟṟapin
niṟka ataṟku taka

Learn well whatever is to be learned; then let your conduct befit your learning.

எண்ணென்ப ஏனை எழுத்தென்ப இவ்விரண்டும்
கண்ணென்ப வாழும் உயிர்க்கு

eṇṇenpa ēnai eḻuttenpa ivviraṇṭum
kaṇenpa vāḻum uyirku

Numbers and the remaining letters—these two—are to living beings like their twin eyes.

திருவள்ளுவர், திருக்குறள் 40:391–392
Tiruvaḷḷuvar, Tirukkuṟaḷ 40:391–392

Preface to the Student

This book has been written to empower you—the student—to succeed in your studies and become self-reliant. Time-tested techniques are presented to enable you to master the irreducible core of all academic learning: reading, writing, and mathematics.

Regardless of where you live, or what you study, whether you are eight or eighty, whether you are in the thick of high school studies, or have retired from the workplace, and whether you simply want to pass your next examination, or dearly want to realize your schoolday dreams of reciting Shakespeare or mastering mathematics—this book is written for you.

In it I share with you practical methods that have worked for me at school and university. I hope that they work for you too.

Learning is lifelong and it is a skill that *can* be cultivated. I hope this book instils in you a love of learning that will endure for life.

Structure of this book

This book has more than sixty chapters, spread over eleven parts, covering different aspects of academic success as shown in List 0.1.

Browse the table of contents to get an overall idea of what is in this book.

How to read this book

I have tried to make this book as complete and comprehensive as I can. I wanted to write *one* book that would help you right from your schooldays, through university, and beyond. This is that book.

It is a *long* book. In fact, it is *eleven* books rolled into one as you might already have noticed. Don't be deterred by its size.

It is replete with techniques, suggestions, and references. You need not read everything at once. Indeed, you might never need to read the

PARTS OF THIS BOOK

1. You
2. Mind
3. Resources
4. Study Techniques
5. Reading
6. Writing
7. Vocabulary
8. Mathematics
9. Examinations
10. University Studies
11. Working Life

LIST 0.1: The eleven parts of this book.

whole book from cover to cover at one go. Take a bite at a time, chew it slowly, put it into practice, and assimilate it.

Read and apply what you need first.
Browse the rest.
Repeat the cycle.

Companion website

The companion website for this book is at
https://swanlotus.netlify.app/sas.html

Do visit the website. It contains articles on different academic subjects and an active eclectic blog. You will also find ancillary material there relating to each chapter. What is more, you can post feedback on the site and share with me your thoughts to help improve this book.

The Web is an ever-changing, instantly accessible, almost sentient reservoir of information. Accessing it efficiently and wisely can catapult your academic performance to stratospheric heights.

In Chapter 20, I share with you my knowledge for harnessing the Web and the PC to learn and to do research. The companion website will feature periodically updated versions of this chapter, as the Web and its technologies continue to evolve.

A word of warning, though. Always exercise caution when using the Web: no one guarantees the authenticity, integrity, and factual correctness of the information on offer. You should always cross-validate before accepting what is said.

Unfamiliar words

I have used English words in this book as they occurred to me naturally. I have *not* consciously restricted the vocabulary so that only easy words are used—a practice that is pejoratively known as "dumbing down" the text. I wanted to dunk you directly into the swimming pool of real English because that is where you need to swim, not the shallow wading pool of a beginner's vocabulary. Neither have I written to show off my erudition: my only aim is to help.

What should you do if you come across an unknown word or phrase? You should look it up. How? In a dictionary, whether electronic, or printed on paper.

Visit the companion website and read the relevant articles and blogs. They tell you how and where to look up the meanings of new words on the Web.

?? in this book is devoted to helping you enlarge your vocabulary. Read and follow it: look up new words, learn their meanings, know their etymologies, and use them in speech and writing. In due course, you will enjoy playing the detective game as you search for the meanings of new words and expressions and—after using them—make them your own.

Tone

I speak directly to you, my reader, in this book. I have given you the prescriptions and proscriptions—the dos and don'ts—that have worked for me. My intention has not been to moralize or patronize. I have not adopted the tone of a teacher. Instead, I just wanted to share my

experience with you—as an elder brother would with his siblings—in the hope that it might help you. Take my advice or leave it, just the same, but do not take umbrage. No offence is intended.

Repetitive style

I have deliberately *repeated* myself in this book. What has been stated in one chapter *in extenso* is sometimes briefly re-iterated in another. A single concept might be explained in varying depth or detail across several chapters. My purpose in doing so is twofold.

First, repetition emphasizes and embeds an idea in the *memory,* making recall easier. Second, I have tried to make the different chapters *self-contained* to help you read this book a chapter at a time without having to go back and forth across its pages.

Aids to reading

Each chapter begins with a *synopsis* and ends with a *summary*. The synopsis prepares you for what lies ahead. The summary reminds of what you have already read.

Spread throughout the book, including this Preface, are what I have called *starboxes,* an example of which is shown below:

A starbox is a box with a central star that highlights some concept that has been presented in the text. This is a starbox.

You may glean the main points of the exposition simply by looking at these visually arresting starboxes. They help you browse quickly. They also aid revision. Even if you read only what the starboxes contain, I hope that you would have gotten something useful from this book.

Some chapters deal with questions and answers, and possibly some commentary on them. Traffic light colour coding has been used to help you identify questions, commentary, and answers; examples are in blue with a star at the end:

- QUESTION

  This is a simulated question.

- COMMENTARY

  The commentary could be about the question, or the answer, or both.

- ANSWER

  This is a simulated answer.

- EXAMPLE: SIMULATED

  This is a simulated example. ★

Abstract, customize, apply, and succeed

Academic success depends on knowing the techniques for efficient and thorough study, applying them diligently and consistently, mastering your subject, and acing your examinations. Success does not come in a can. Nor is there a "success pill" that you can swallow to get instant results. It takes knowledge, effort, practice, patience, and persistence to succeed.

If a technique or idea in this book does not fit like a glove, modify it until it does, and use it to succeed. I have given general principles and explained the reasons behind them. Using those reasons you can extend, refine, or otherwise adapt what has been given until you have fashioned your own comfortable, customized, private manual of study.

★

Abstract. Customize. Apply. Succeed.

It has been said that an ounce of practice is worth more than a ton of theory. Put into use what you find here. Then, and then alone, will your marks improve, your understanding mature, and your keenness for new knowledge grow. Jump on the bandwagon of learning for life and enjoy the ride!

Mathematics

Mathematics is usually the most daunting academic subject. Given its notoriety, I have dedicated one entire part of this book, comprising five chapters, to mathematics. I have also singled out mathematics for special mention in this preface.

We cannot escape mathematics in our scientific age. So, let us *try* to become more friendly with it. This is the spirit in which I have written about mathematics in this book.

Those who do not need to study mathematics for their examinations can still enjoy its intellectual pleasures. With this in mind, I have written one chapter on the enjoyment of mathematics: it introduces you to my personal, eclectic choice of popular mathematics books that should enrich you if you read them.

For the serious student, there are chapters on overcoming mathophobia, reviewing arithmetic from a mathematically mature standpoint, mastering problem solving, and on coping with university mathematics. I hope this mix caters to all needs and tastes, and that it will lead to a more comfortable relationship with the subject, whatever your age and prior experience.

Discipline neutrality

I have attempted to make this book discipline-neutral. That means it should be useful to you regardless of the subject you study. I have, for instance, drawn questions from different disciplines in **??**, on answering examination questions, so as to address as varied an audience of students as possible.

If there are parts of the book that are difficult to grasp because your background is in the humanities, for example, rather than in the sciences, please send me feedback from the companion website, so that I can improve future editions of this book.

American and British usage

The spelling, terminology, and usage of the English language vary across the Atlantic, if not the world. In this book, the spelling is British and the units are metric. There is no separate American edition. I hope that this does not cause consternation among readers in North and South America.

What is called "primary school" in the UK is called "grade, elementary, and sometimes intermediate school" in the USA. The British "secondary school" corresponds roughly to "middle and high school" in the Americas.

"University" is sometimes referred to as "college" or even "school" in the United States. I seek the reader's kind indulgence in making these equivalences mentally while reading the book. Muchas Gracias! Dankeschön! Merci beaucoup! Xièxiè! Dhanyavād! Thank you! ☻

Citations

In academic settings, it is customary to substantiate statements or quotations with *citations* to books or papers where the said fact has been established and accepted as such. On other occasions, you might be referring to a book or website in your writing. To assist the reader locate that book or website, it is proper academic etiquette to provide a citation where the details of the book or website are given.

In this book, citations appear as numbers within square brackets, like so [5], and refer in turn to the books, papers, or websites bearing the same number in the "References" section at the back of each chapter.[1]

Above all else …

R (Chandra) Chandrasekhar
May 2022

[1] This book is intended for a general rather than academic audience. Nevertheless it features devices reserved for academic books, like citations and footnotes, to gently introduce the reader to such practices.

Ac-

KNOWLEDGEMENTS

My first debt of gratitude is to my father, Mr M K Ramachandran. When I was a high school student, my father bought me a book by Eugene M Schwartz [**schwartz65**][1] entitled **schwartz65**. It was not available in local bookstores at that time, and if I recall correctly, my father cut out a newspaper advertisement and ordered the book by mail shortly after it was first published in the USA.

I devoured the book when it arrived and applied its principles to my school work. *And those methods worked.* I started topping my class consistently from then on. I have imbibed and made my own so many of the ideas Schwartz imparted in his book that it would be well nigh impossible to cite him meticulously in this book each time I have drawn upon his techniques. Suffice it to say that much in this book has been coloured by an idea, or principle, or technique propounded in his book. To Mr Schwartz, I express my grateful thanks in and through this book.

I have also been very fortunate to have been taught by excellent teachers in my formative years. Some were inspiring and memorable, others transmitted their love of their subject to me, while still others had the admirable ability to clarify and lucidly explain the intricacies necessary to master their subjects. If not for them, this book could not have been written.

I would especially like to express my deep gratitude to:

- Mrs Kate Nelligan, YWCA Kindergarten, Penang, Malaysia; Che Zainon Tajuddin, Miss Ngoh Peck Choo, and Brother Gaston, all of La Salle School, Brickfields, Kuala Lumpur, Malaysia;
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- Mr Vincent Sebastian, Mr K K Chellappa, Mr Stanley McMahon Culas,

[1] This excellent book sadly appears to be out of print at present.

and Mr K Koshy Samuel, all of Saint John's Institution, Kuala Lumpur, Malaysia.

In some small measure, I hope to repay their kindness to me by collating all the precious nuggets of knowledge they have given me over time into this volume, and sharing it with students all over the world.

When I was preparing for my GCE O Levels, I chanced to hear on radio a series of programmes entitled "The Chief Examiner Explains," one for Science and Mathematics, and the other for English. The Chief Examiners in these two subject areas—for the Cambridge Local Examinations Syndicate in that year—explained how to answer differently phrased questions, and what the examiners were looking for in candidates' answers. The hints they gave were revelatory to the receptive student. I have distilled what I recall from these programmes, and what I have learned during my subsequent academic life, into this book. To the then Chief Examiner in Science, Mr Bill Kearsey, and to the Chief Examiner in English, whose name now escapes me, my humble gratitude.

As part of my university education, I had to write three research theses:

- an Honours thesis at the University of Western Australia, as part of my B E Degree, supervised by Dr J L Hullett;
- a Master's thesis at the University of Toronto, as part of my MASc degree, supervised by Associate Professor M L G Joy; and
- a PhD thesis at the University of Western Australia, for my PhD degree, supervised by Professor Yianni Attikiouzel.

To these three mentors, I give my special thanks because they taught me how to do research and how to write. My interactions with Professor Attikiouzel were especially fruitful, as they occurred later in my academic life when I was better able to imbibe the wisdom he imparted.

In a way, this book is the logical outgrowth of **??** entitled "How to Write a Thesis" which was originally written for a seminar that I once presented at the University of Western Australia. Several fellow academics and colleagues critiqued that exposition. I thank Professor Yianni Attikiouzel, Dr Chris deSilva, Dr Mike Alder, Professor Peter Hartmann, Mr Peter Jones, Emeritus Professor David Lindsay, and Dr John Morris for their helpful comments on earlier drafts of the chapter.

I am indebted to Professor M Muthuraman, retired Professor of Entomology, Tamil Nadu Agricultural University, for the facts about bees and their habits, that I have introduced in **??**.

From the genesis of this book to its execution now, I have relied upon the work of many.

This book has been typeset using TEX-based open source software, details of which are given in the Colophon at the end. The number of people who have unselfishly given so freely of their time, knowledge, and software runs into legion. Although I do not list them here, I thank them all from the bottom of my heart.

Several people have cast a careful and critical eye on chapters in this book. I am deeply grateful to Dr R Gopalkrishnan, Dr Jothi Kumar, Mr Wong Kai Yeng, Dr Ben Readhead, Dr P V Kurien, and Ms Catherine Jennings for so generously giving of their time to critique this book and also for encouraging me. Dr Madangopal Narayanan, Dr Siddha Nayki, Mr James Devenish, Mr Dylan Del Frate, and Mr Swetam Ramanathan gave me comprehensive and incisive reviews, which coming from real high school and university students, are most appreciated.

Any errors that remain are my responsibility alone and I seek kind feedback from readers of this book to help me remove them in future editions.

My last and most profound thanks go to my wife, Mrs Jayanthi Chandrasekhar, and my son, Mr Nandakumar Chandrasekhar. Were it not for their unwavering support, understanding, patience, comments, and encouragement over a span of well nigh two decades, a book of this scope and magnitude could not have come about.

Part A

You

1

Motivation, Learning, and Success

Synopsis

Studying is the vehicle. Motivation is the fuel. Goal-setting is the map. Success is the destination. This book helps you make the journey to academic success. Undertake it and enjoy the ride!

Cultivate and develop intrinsic motivation. Feed your innate curiosity to probe, experiment, and learn. Once you know the joy of discovery, you will become a lifelong learner.

Academic study is necessary for academic learning. Effective study results in successful learning. Ensure that you truly learn what you study.

Learning has four stages: *naming*, *knowing*, *doing*, and *being*. Each stage feeds into the next. When you reach the *being* stage, you have mastered what you set out to learn. Practice, perseverance, and patience are vital.

Build greater successes upon smaller successes. Finish what you set out to do. Complete tasks on time. Learn from mistakes. Never be afraid to accept that you do not know. Ask questions. Seek answers. Succeed academically. Learn for life.

1.1 Motivation is prime

Motivation fuels success. Whatever your goal in life, you must be motivated before you can achieve it.

Motivation is a potent mixture of the desire to achieve and the willingness to exert, until success is attained.

1.2 Three types of motivation

Broadly speaking, there are *three* types of motivation [**pink2011**]:

1. instinctive motivation
2. carrot-and-stick motivation; and
3. intrinsic motivation

Instinctive motivation is driven by biological imperatives like the instinct to survive, the need to assuage hunger, and slake thirst. Think of a drowning man struggling to cling on to dear life and breath and you will get the picture.

Carrot-and-stick motivation is based on reward for a desired outcome and punishment for an undesired outcome. It drives a person to work harder for more pay, or for a gold medal, or for praise from peers. It is also why people get fined for exceeding the speed limit on roads, as a disincentive to repeat offending behaviour. Such motivation, coming as it does from the outside, is *extrinsic*.

Intrinsic motivation or *self-motivation* occurs when the joy of performing an action is its own reward, and justifies the effort lavished on it. No external inducement is necessary.

Intrinsic motivation is an impulsion from within rather than a compulsion from without.

All creativity—artistic and scientific—is inspired by this inner drive to excel. It is this motivation that fuels collective altruistic endeavours like the Open Source software movement [**raymond00**, **weber2004**] and Wikipedia [**wikipedia**], both of which contribute to the collective good, supplanting commercial gain as the driving force.

Autonomy, mastery, and purpose drive the self-motivated person [**pink2011**]. Through this book, I seek to *empower* you as a student, give you hints on how to *master* your subjects, and suggest that you develop an interest in *lifelong learning* as a guiding principle.

I have assumed that you are a self-motivated aspirational scholar who wants to succeed academically. If you are not already driven from within, I exhort you to cultivate intrinsic motivation. Others cannot infuse it into you. Neither can they bequeath it to you. Only you can patiently grow it within you.

Do what you love and love what you do.

The thrill, fulfilment, and joy you receive from intrinsic motivation far exceeds what you get from the carrot and stick variety. It is an expression of the magnificence innate in the human state. It enhances, empowers, ennobles, and enriches.

1.3 Learning versus studying

What is the difference between *learning* and *studying?* They are related words, which are similar enough to be used interchangeably at times, but different enough to be distinguished when occasion demands.

Learning is the goal; studying is the means. When you have learned something, you already know it; when you are studying a subject, you are striving to know it. Learning is natural; studying is deliberate and formal. You learn your first language naturally merely by exposure to it; but you need to formally study a foreign language in order to learn it. You learn a practical skill whereas you study an academic subject. Thus, you learn to walk, swim, ride a bicycle, drive a car, and cook a meal, without studying. But study is required to know mathematics, physics, economics, and other academic disciplines. When you study something, you deliberately apply your mind *with concentration* to learn something. So, there is a distinction between goal and means, between a natural and a deliberate process, and between something practical and something academic.

You can learn without studying, and study without learning, but you most certainly want to avoid the latter!

1.4 Studying as the core of learning

As a student, you learn by listening, reading, writing, thinking, discussing, revising, and otherwise assimilating knowledge. The core of learning takes place when you study.

When studying is effective, you have successfully learned what you set out to know.

1.5 Motivation to study

Why study? Why do *you* want to study? Do you *really* want to excel in your studies? It is important that you ask yourself these questions, and answer them honestly to yourself. You will then become acquainted with your attitude toward studies. Your answers will reveal what drives you to acquire and apply new knowledge.

Don't skip this step or gloss over it. Confront and accept the truth, whatever it is. If you do not like your answers, you can work at changing your attitude toward your studies. Self-motivation can be nurtured. But you will never know what to do, if you do not know where you stand.

Your teachers and lecturers can at most infuse interest in different subjects. They cannot inject their enthusiasm into you. That can arise only from within you by a process of resonance.

If you dislike studying and are doing it only to please your parents or someone else, you lack the inner drive to do well. This book might assist you a little, but it is unlikely to make a sea change in your academic life. For that to happen, there must be some deep desire within you that motivates you to do well in your studies.

The drive to excel in your studies must be an impulsion from within, not a compulsion from without.

Regardless of what others think or say, if you *yourself* are convinced that you should study well, you certainly will. Perhaps you have peered into the future, and realize that studying well can lead to plenty of money. Or perhaps you have an ambition to become a professional, like a medical doctor, architect, engineer, scientist, or other professional. Or perhaps you believe that knowledge is power, and would like to become a teacher or professor. Or you might wish to serve society by entering public service or government. Or perhaps, you simply find learning new things a joy in itself.

In all such cases, much study lies ahead of you, and hard work should not put you off. Whatever your motivation for studying, as long as it is innate and not enforced, the ideas in this book will help you to do well. Buckle up and enjoy the ride!

1.6 Curiosity and a sense of wonder

Even as babies, we are equipped with the curiosity to probe, to enquire, to experiment, to discover, to know, to learn, and to wonder.

This sense of wonder, and the accompanying innate curiosity to explore and discover, form the most enduring foundation for a life of learning.

Can you recall from your childhood the thrill of finding out something for the first time? Can you bring to mind the fresh, wide-eyed wonder with which babies look at the world?

All too often, alas, we lose that sense of curiosity as we go through life. A dozen or so years of school education and competitive examinations might have all but replaced that wide-eyed wonder with bleary-eyed confusion. If you find yourself in that boat, the ideas in this book could very well help rejuvenate your learning experience by removing examination anxiety and putting back the fun into learning once more. You will become a self-motivated learner.

1.7 The four stages of learning

I think of learning as a progressive four-stage process involving *naming*, *knowing*, *doing*, and *being*, as shown in Algorithm 1.1. Mastery of any one stage is necessary to progress to the next. And you might be engaged in different stages with different subject areas. Effortless mastery comes with the fourth stage.

The Four Stages of Learning

1. Naming
2. Knowing
3. Doing
4. Being

Algorithm 1.1: Learning as a four-stage algorithm.

Regardless of whether you are learning a theoretical subject like accounting, or a laboratory-based subject like chemistry, or a praxis-based subject like cooking, or a skill like swimming, these four stages apply to them all.

1.7.1 Naming

The first stage of learning is *naming*. The first words a baby is taught are names for itself and its parents, names for parts of its own body, names for objects in its surroundings, and so on.

Nouns come before verbs. *We cannot know what we have not named.* In every field of human endeavour, naming precedes all knowledge. Often, this leads to specialized terminology: the medical doctor, the lawyer, the priest, the mathematician, the physicist, the ecologist, the historian, the economist, the builder, the plumber, the midwife, the tailor, the soldier, etc., all have their own jargon.[1]

Each subject you study will have its own nomenclature. Ensure that you master it. Being unsure about word meanings when learning is like erecting a building on shaky foundations: it is condemned to be forever wobbly and unsafe.

[1] Which makes life varied and interesting. ☻

1.7.2 Knowing

Knowing is the second step in learning. Knowing the *definitions* in your subject allows you to further your knowledge of it. An example will make this clear.

EXAMPLE: DEFINITIONS

In physics, the terms *force, power,* and *energy* all have special and precise meanings that are different from the lax, everyday meanings we assign to these words in casual social discourse. The student of physics must not only *know* these special meanings, but must also be able to recall their mathematical definitions and the units in which they are expressed. Knowing encompasses all these. ★

Each and every subject known to man is built upon certain *principles*. Knowing these theoretical underpinnings of your subject is the next step. Again, some examples are helpful.

EXAMPLE: PRINCIPLES

If you are studying physics, there are laws governing force, energy, mass, momentum, etc., that you must become familiar with. If economics is your subject, you need familiarity with how supply and demand affect prices. If you are studying the life sciences, ideas like homoeostasis, the laws of heredity, etc. must become your stock-in-trade. ★

Knowing goes beyond *naming*. It requires a particular idea to be defined, related to other ideas, described both qualitatively, and where applicable, quantitatively, perhaps using a mathematical formula. *Knowing* means becoming thoroughly acquainted with the definitions, principles, and theories governing your subject. It prepares you for *doing*.

1.7.3 Doing

Doing is the third stage of learning. To be useful, all knowledge must be applied. Even in purely theoretical fields, knowing a theory must lead to doing something with that theory, like making a testable prediction from it.

In praxis-based disciplines like surgery, or gymnastics, or nursing, or motorcar repair, *doing* means actually doing something with your hands, based on knowledge you have acquired in the first two stages of learning.

Even in fields like mathematics, where *doing* may simply be putting pencil to paper to prove a theorem, or in computing, where it might be testing a program you have designed, *doing is more active than knowing*. By *doing*, you move from the *noun-phase* to the *verb-phase* of learning.

Practice is paramount to master *doing*. The more you practise, the better you get. If you play a musical instrument, you will know this from your own experience. From cooking to computing, from scuba-diving to surgery, from teaching to tailoring, practice makes you perfect at *doing*.

Practice requires perseverance and patience because you will make mistakes in the beginning. As you patiently persevere and practise more, you will make fewer mistakes until you become well and truly proficient.

The *doing* phase of learning is built upon three Ps: practice, perseverance, and patience.

1.7.4 Being

The *being* stage of learning is reached when *knowing* has fused with *doing* to the point where performing the task is effortless. This happens in all fields of human activity.

In integrated skills like swimming or cycling, there is a particular, clearly defined point at which the skill has been mastered. Once you have learned how to ride a bicycle, you cannot suddenly "unlearn" and forget how to ride it. Once you have mastered swimming, you never forget how to swim. *The skill has become part of you.*

This stage of effortless mastery is called *being*. Having reached it, you have mastered whatever you wanted to learn, and made it a part of you. This is the expert state of learning, and once you have attained it in any subject, you should spend your efforts keeping your skills sharp. You could also start learning *other* subjects or skills, expanding your expertise.

The purpose of this book is to assist you to reach this *being* state in the subjects you are supposed to master at high school and university, and to inspire you to keep learning all your life.

1.8 Recapitulating the four stages

In the *naming* stage you get acquainted with a specific branch of learning. In the *knowing* stage you learn the theory. In the *doing* stage you apply

the theory to solve problems. In the *being* stage, you have internalized the knowledge so that whenever it is needed, you can apply it effortlessly, because you have mastered *naming*, *knowing*, and *doing*.

1.9 Success

Success means different things to different people. All-round success includes academic success but is not limited to it. In this book, we are concerned principally with *academic success*, which may be translated roughly as *doing well in your studies.*

The principles underlying success are numerous and touch upon almost all of life, as shown in Chapter 14 and other chapters of this book. Here, I want to outline the basics of success and tie them both to motivation and to learning.

In Section 1.5, I have already asked you why you want to study, so that you may fathom your own motivation. I shall assume here that you have a deep-seated personal impulsion to study and that you are not doing it simply to satisfy someone else or to get them off your back.

Motivation is vital for success.

1.10 The journey analogy

Before you begin a journey, you must know where you want to go. You also need a vehicle to take you to your destination, and fuel to run that vehicle.

The destination is your definition of success. The vehicle is the process of learning. The fuel for the vehicle is your intrinsic motivation. This book is mostly about the vehicle; you need to supply the fuel and the destination.

1.11 Goal-setting charts the path to success

A journey without a destination is purposeless and degenerates into aimless wandering. A map aids you in getting to your destination. If your destination is success, the map that gets you there is goal-setting. If you do not set clear goals, you cannot know if and when you have succeeded. Let me help you clarify what success and goal-setting can mean to you.

Example: Clear Goals

Suppose you define success as "doing well in your studies". What exactly does that mean? Does it mean barely passing all your subjects? Or does it mean getting distinctions in all subjects? Or does it mean something in between?

Does it mean succeeding academically as well as socially? Does it mean a good job and plenty of money after studies? Or does it simply translate into the sheer joy of knowing? How all-rounded do you define success to be? How important to your definition of success are extra-curricular activities like sports, debating, voluntary service, etc.?

There are so many facets to success and you need to choose. It is like choosing one particular route from many possibilities before you begin your journey. ★

If motivation is the fuel, goal-setting is the map. Even if your fuel tank is full, you cannot go anywhere if you do not know where you want to go and/or if you do not know the route to get there. Clearly defined goals accomplish both these ends.

The first rule of success for any undertaking is to set unambiguous goals and to work to achieve them.

Whether you are setting out on a journey, or are practising for an important tournament, or are studying for an examination, you need a clear picture of what you want to achieve. If you want to reach your destination in five hours, you can choose your means of transport and plan your route accordingly. If you want to be champions in the tournament, you can set aside enough time for practice, and also plan both strategy and tactics depending on who your opponents are. If you are planning on high distinctions in three subjects and credits in four others in your examination, you can apportion your time and effort accordingly.

You require a precise goal toward which you can work rather than a vague "motherhood and apple pie statement" like "I want to do well in my studies."

If you wish to top your class in history, it is important that you clearly define that goal for yourself, so that your entire being—body, will power, conscious mind, and subconscious mind—can all work in concert to achieve it.

Harness both head and heart to reach whatever goal you set for yourself.

1.12 From smaller to greater successes

There is a saying that "Nothing succeeds like success." I would like to paraphrase and expand it to read:

Nothing motivates like success.
Success begets success.
Smaller successes lead to greater successes.

You need only a small dose of success to inspire you to try harder and do even better the next time. Succeeding in one subject is fuel enough to encourage you to succeed in more subjects. Cultivate a small patch of success and grow it into a vast landholding of success.

Start small. Identify a worthy, *nontrivial* goal that has eluded you in the past but which *seems to be within your grasp.* Ignite your mind with ambition to accomplish what you desire. Apply yourself until you succeed.

Setting a small, achievable goal means that you will neither be discouraged by its difficulty nor overwhelmed by its immensity. Because it is not overly ambitious, you will surely succeed in the end. Because it is not trivial, achieving your goal will give you a sense of accomplishment. The sweat and toil to attain your goal will grow your muscles of patience and perseverance. But the demand on your mental stamina will not be excessive because your task is tractable. If you work at it consistently and never give up, you will accomplish.

Once you have achieved your goal, you will exult in a sense of triumph. *You have succeeded.* That magic sense of accomplishment will spur you on to tackle more demanding tasks and succeed at them. The memory of your victory will form the foundation for further successes in the future. Smaller successes will spawn greater successes until you have a "success mindset". You will then become a person to whom success seems natural and inevitable.

This *divide et impera* or "divide and conquer" is a very powerful approach to solving all sorts of problems. Try it. Use it. Remember it.

Algorithm 1.2 is a summary of this technique of cultivating smaller successes on the road to greater successes.

Culitivating Success

1. Choose a worthwhile goal.
2. Break it down into smaller, achievable tasks.
3. Identify *one* such task.
4. Develop methods to accomplish that task.
5. Apply yourself until you succeed.
6. Repeat the cycle on other tasks until you reach your original overall goal.

Algorithm 1.2: Cultivating success.

1.13 Finish what you set out to do

The great Tamil poet Mahakavi Subramania Bharati begins one of his inspiring poems with the line எண்ணிய முடிதல் வேண்டும், transliterated as *eṇṇiya muḍital vēṇḍum*, meaning "Finish what you set out to do." This one line can very well be your personal aphorism of success. Finish what you set out to do.

In the context of building greater successes upon smaller successes, you must not yield to complacency after succeeding at a smaller task. Keep hacking away until you achieve your original overall goal. To be satisfied with something less than what you originally set out to do is to diminish your own potential and deny your own abilities. Take care not to fall into the trap of smug satisfaction.

There is a cliché that some people are great starters but poor finishers. It means that you approach a new task or project with great zest and gusto but your will power, tenacity, and diligence taper off with time so that you end up not completing the project. Sometimes, such people might even delude themselves that their half-finished project *was* what they initially set out to do. This is where goal-setting is vital because it will show you when your project is really done. You cannot then delude yourself in this way.

1.14 Complete on time

Perfectionists attempt to do *everything perfectly* and end up completing nothing on time. This is not acceptable in the academic arena. Nor is it allowed in the real world. The person who habitually misses deadlines will not be employed for long. Needless to say, if you spent all your time in an examination on completing just one question, where you needed to finish five, you would be failed outright in that subject.

Develop a balance between finishing on time and doing something perfectly.

1.15 Academic success and its two disguises

Academic success wears two disguises: one is *ignorance;* the other *failure.* Do not shun either if you meet them. But neither should you welcome or seek either. ☻

1.16 Enquiry opens the gates to new knowledge

Ignorance and knowledge are the obverse and reverse of the same coin. Convert ignorance to knowledge by metaphorically turning over the coin. Enquiry is the gateway to all new knowledge. To open it you need to do four things:

ENQUIRY

1. Never pretend to know something which you do not know.
2. Identify what you do not know.
3. Ask questions that will dispel your ignorance.
4. Seek answers to your questions.

ALGORITHM 1.3: Enquiry as the gateway to new knowledge.

First and foremost, never pretend to know something you don't know. Be honest. Be humble enough to admit "I don't know". This magic mantra opens the doorway to new knowledge. Suppress it and you will always remain steeped in ignorance. Admit it and start seeking knowledge: you will find it.

Be precise in identifying what you do not know. If you are vague about your ignorance, you cannot dispel it.

Ask questions to find out what you do not know. Seek answers. Attain new knowledge. Build upon it. Repeat the cycle. Never be afraid to ask a question to dispel ignorance. There is a joy in finding things out. Become a lifelong learner.

1.17 Mistakes are part of learning

Failure is a stepping stone to success. Its lessons are extremely valuable and I have dedicated Chapter 13 entirely to this subject. Making mistakes is part of learning.

When we do something for the first time, we are very likely to make mistakes. Your first attempts to ride a bicycle probably resulted in quite a few falls. If you have never cooked before, your first culinary creations might not exactly be gastronomic delights. If you have never debated in front of an audience, you could experience the jitters during your maiden speech.

Don't get upset if your first try at something is a failure.
C'est la vie.

The important thing is to try—and try again— until you succeed. Here is why.

The human brain is a remarkable organ. In one aspect, it may be viewed as a programmable computer. It is equipped to deal with immense complexity, and what is more, it can be re-wired for any task. This flexibility to learn anything arises from the brain's ability to learn from examples, and from mistakes.

We learn by making mistakes, and by correcting for them, until we get things right.

If you look at a toddler attempting to take his or her first steps, you will find that the infant falls many times and might even cry for a while. But, most importantly, the child makes the attempt *again and again*. By making repeated efforts, the child's brain is gradually re-wired to the

rhythm of walking. The first independent and clumsy steps gradually lead to a smooth and confident gait where swing follows stance effortlessly. Practice makes perfect. Most importantly, after mastering walking, the child discards the memories and pain associated with falling.

1.18 From motivation to success

Your journey to academic success will involve much study and learning but its starting point is always motivation and its destination is always success, working in a virtuous circle, as shown in Figure 1.1.

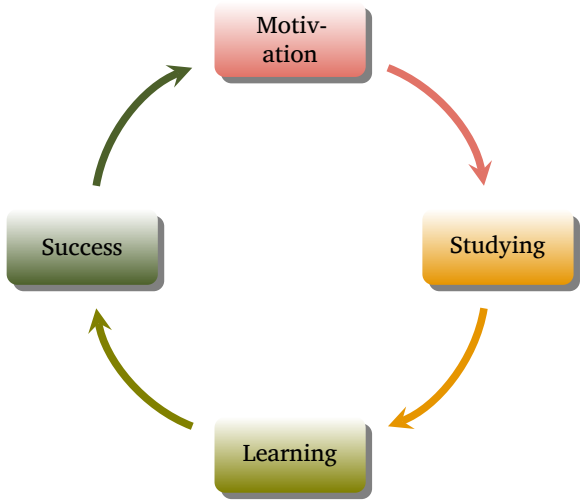


FIGURE 1.1: The virtuous circle of motivation and success. When motivation succeeds, that success itself motivates, giving rise to a virtuous circle. The core of academic learning takes place within this virtuous circle when you study, and learn as a result.

1.19 To explore further

Books on success are among the perennial bestsellers. Some become enduring classics that remain continuously in print for decades. They often dwell upon those aspects of the human mind and spirit that are not always acknowledged or cultivated.

Here is a personal list of books on success that I am familiar with and have found useful. The first book is short and sweet, and small enough to fit into your pocket. It is the eminently practical **pysuccess98** by **pysuccess98** [**pysuccess98**]. The second book is the monumental **hill1928** by **hill1928** [**hill1928**] which was immensely

influential when first released and which remains so to the present day. Two other enduring classics I have found inspiring and useful are **murphy2006** by **murphy2006** [**murphy2006**] and **peale2004** by **peale2004** [**peale2004**].

It would be impractical to list more such books here. A saunter down the "motivation" or "self-help" aisle of your local bookstore will help you identify many more books devoted to the topic. Read and follow those that resonate with you.

SUMMARY: MOTIVATION, LEARNING, AND SUCCESS

- You need motivation to succeed at anything.
- To excel academically, you must be impelled from within; you cannot be compelled from without.
- Effective studying leads to successful learning.
- The four stages of learning are: *naming*, *knowing*, *doing*, and *being*. You have mastered your subject when you reach the last stage.
- Set clear goals to define what academic success means to you.
- Start succeeding at modest tasks. That will motivate you to undertake more difficult ones.
- Success breeds success.
- Finish what you start and finish on time.
- Never pretend to know something when you don't know it.
- Never be afraid to ask questions about something you don't know.
- Seek answers to your questions.
- Expand your knowledge.
- Mistakes are a necessary part of learning.
- Motivation is the fuel. Studying is the vehicle. Clear goals are the map. Success is the destination. Embark on your journey to academic success. Enjoy the ride. Enjoy lifelong learning.

4

BECOME YOUR OWN OBSERVER-AUDITOR

SYNOPSIS

When you solve a mathematics problem, check your working every few steps, and correct it if necessary. When you write, review your work, and silently read it to yourself—in your mind—to determine how well it reads. If you do not like what you hear in your mind, rework your writing.

Such detachment while being active requires the mental skill of *detached witnessing*. It is something we humans are capable of. Initially, it will be difficult. But with practice, it will become easier. When it becomes second nature, you have within you, your very own personal friend, guide, and philosopher: *yourself*. I call this *becoming your own observer-auditor*.

This practice will reward you not only in your studies but also in many other circumstances in your life. It will save you from needless strife with those around you. It will induce calmness and introspection before reaction. It will make your speech measured and circumspect. It is mighty helpful during job and promotion interviews. Overall, it will make you a more balanced and successful individual.

One point to beware though. Do not practice this when your attention needs to be laser-focused, as when you are driving on the road. You cannot then relax your attention on the traffic, for a few seconds of mental abstraction could be hazardous to you and others.

As long as you exercise your common sense about when to do it, becoming your own observer-auditor will help you scale undreamed of heights and succeed wildly.

> Self-observation brings man to the realization of the necessity of self-change. And in observing himself a man notices that self-observation itself brings about certain changes in his inner processes. He begins to understand that self-observation is an instrument of self-change, a means of awakening.
>
> *In Search of the Miraculous* [**gurdjieff2001**]
> GEORGE IVANOVICH GURDJIEFF (1872–1947)

4.1 How I became my own Observer-Auditor

The example below is an account of how my desire to reduce errors in mathematical problem solving inadvertently led me to this very useful study paradigm: the *observer-auditor*.

EXAMPLE: HOW I BECAME MY OWN OBSERVER-AUDITOR

When I started doing Mathematics seriously at school—to master the subject and score high marks in it at examinations—I unconsciously developed the ability to become my own observer-auditor.

I wanted to cut down the *number of errors* I made when solving a mathematics problem. I also wanted to catch those errors *as soon as they were made* rather than six pages downstream.

One way was to practise, practise, and practise, until solving a particular type of problem was second nature to me. That was a rote method which cut down the number of errors, but did little to help immunize me against errors when solving new, unfamiliar types of problems. I needed a more generic solution.

To catch errors as soon as they were made, I realized that I would have to halt every few lines and go over the working, before resuming the solution. This was a start-stop-start technique that was a little jerky at first. Some errors still remained, and the time spent in checking was borrowed from time that could have been used for solving.

The reason I still made errors was because I was not *sufficiently detached* from my work to view it with *fresh eyes* when checking it. *I had failed to separate the solver of the problem from the checker of the solution.*

Accordingly, when I paused after every few lines of working, to go over what I had written, I would *detach myself* from it as much as possible, and review my solution with the critical but impartial eye of an instructor or examiner.

I was thus able to catch my errors almost as soon as they were made. By not allowing a few erroneous lines a chance to snowball cumulatively into several erroneous pages, I saved myself valuable time and effort. Some errors still escaped me, but the majority were caught in time and on time.

In this way, I slowly developed into my own internal critic, not only in Mathematics, but also in English, where I was both an observer and an auditor.[1] The prose I had written should not only appear correct to the eye, but should also sound pleasant to the ear.

In the fullness of time, I was able quite literally to split myself into two: one person doing the writing, and the other doing the review, calling a halt when a correction was due. These two activities, which initially were two separate steps, gradually coalesced into one action of writing and almost simultaneous checking and correction. I had developed into my own observer-auditor. ★

This splitting of myself into two parts—the writer as the first part and the observer-auditor as the second part—is one of the most rewarding habits I was led to cultivate during my studies.

4.2 *The Reader Over Your Shoulder*

The book, **shoulder2017**, was first published in 1947. It has been called "…the best book on writing ever published." [**shoulder2017**]. I will be looking at this book, among others, in detail in **??** where we look at "Writing".

As alluded to by the title, the authors—**shoulder2017**—advise the writer to imagine a reader over her/his shoulder, reading what has been written. If that reader could be confused or perplexed by the prose, it is the duty of the writer to amend the text to infuse clarity, brevity, and elegance into it.

This advice is uncannily similar to the observer-auditor whom I am asking you to cultivate as your internal critic, to help polish your expression, whether in Mathematics or English.

[1] The *observer* is the one who *looks critically* while the *auditor* is the one who *listens critically*.

4.3 Importance of splitting yourself into two

As human beings, we have subjective awareness. This means that we are aware of ourselves, and moreover, we are aware that we are aware of ourselves. This faculty is one we all possess.

What I am suggesting here is to further split yourself into an observer-auditor while you perform some other activity. The observer-auditor then observes and corrects whatever errors arise during the performance of the activity. Think of it as *detached witnessing*.

This is *not* an exhortation to become absent-minded, careless, or any such thing. Rather it concentrates your mind efficiently on the task at hand, allowing you to perform it better and perhaps, totally error-free. Think of it as continuous, autonomous, real-time, quality assurance.

4.3.1 Overcoming initial reluctance

Becoming your own observer-auditor might seem strange and even a little mentally unhinged at first. It might remind you of strange folk who talk loudly to themselves, or others who mutter inaudibly with lip movements in an unabashed act of soliloquy, or even worse, of those who hold audible conversations with persons invisible to the rest of us.

Fear not. By becoming your own observer-auditor, you do not risk joining their ranks. This whole habit is an internal attitude of mind. As in all matters, be your own judge. If you find this practice unsettling, eschew it. There is no compulsion: only a reward at the end for those who persevere and master the technique.

4.3.2 Watch your breath

There is an ancient practice dating back centuries when folk who wanted to quieten their minds would sit comfortably and start observing their own breath.

When we breathe we are largely unconscious of the act because it is regulated by the autonomic nervous system. By making conscious what is normally an unconscious act, the ancients could calm and concentrate their minds to great effect.

In watching your breath, you are splitting yourself into two—the one who breathes and the one who watches the breath—to become aware of an unconscious, albeit unitary, act. If you are afraid of becoming your own observer-auditor, try this ancient, calming, meditative practice. If

you find it unnerving, do not proceed further. If you find watching your breath helpful, try to extrapolate the sense of observership to your studies, to become your own observer-auditor, and determine if that helps you too.

4.3.3 Caution while driving

Practising to be your own observer-auditor is a powerful technique; so powerful in fact that it could divert your attention from some visually demanding task—like driving on the road—that you might be performing as second nature.

You cannot and must not relax your attention while driving. Then alone can you avoid danger to yourself and others. So, under restricted circumstances like driving, keep your attention on the task at hand. Practise being your own observer-auditor later; not while engaged in activities like driving.

4.4 Relevance to the four stages of learning

Let us see how being your own observer-auditor can help with the the four stages of learning introduced in Section 1.7. The way to apply this paradigm to each stage is clarified in the abstract example below.

EXAMPLE: OBSERVER-AUDITOR AND THE FOUR STAGES OF LEARNING

The first stage is *naming*. When you are learning new nomenclature, ask yourself what mnemonic or other device you can use to remember the new name. After you have familiarized yourself with the new names, test yourself to see how much has stuck with you.

Repeat the test, without revision, after a week or two, and see where you stand. Then, revise, but this time while you revise the names, let the observer also stand apart in your mind and witness the revision. If you do this often enough, you will almost certainly absorb and recall better than before.

The second stage is *knowing*. What facts adhere to the name you have learned? There is scope in this stage of learning for an explicit question-and-answer dialogue between yourself as the learner and yourself as the questioner-observer. The dialogue can, with practice, become a productive conversation in which you condense your newfound facts into a tightly interconnected ball of knowledge that can be pressed into use at will.

For the third stage of *doing*, practise watching yourself answer problems or questions, and track any errors in what has been recalled or written down. As I have already described in Section 4.1, this is how I stumbled upon the observer-auditor paradigm myself. Practise and make it your own. It will yield rich dividends when put to regular use.

The final stage of *being* is actually the autopilot state of your subject mastery. Your observer-auditor will provide oversight for your already effortless mastery. No unconscious errors can then creep in as everything is vetted not once but twice. ★

4.5 Oral Examinations

If you get to do a higher degree at university you will very likely have to defend a thesis you have written before a panel of examiners, and an audience of all-comers.

This encounter can get quite nerve-wracking because it is difficult to anticipate everything that *could* happen during the "oral" or *viva voce*.

It is not uncommon to start off with the jitters until you hit your stride. Then you will field questions with precision and aplomb. If you have practised being your own observer-auditor, this practice can be of great help during your oral examination.

By setting yourself apart from yourself as the candidate, you remain unperturbed by fears. By viewing yourself, your examiners, and your audience from the vantage point of the observer-auditor, you will experience the detachment necessary to acquit yourself well. You might even excel in your oral presentation and get a distinction for it. ☻

4.6 Interviews

Interviews can be quite unsettling, whether for a scholarship, a promotion, or a new job. You are often presented with problems or hypothetical situations and asked how you would handle them.

You can become quite anxious for several reasons. First, you can never fully predict what you are going to be asked. Second, the situation can appear confrontational—like a predator-prey encounter—and that will only dial up your stress level. Third, you might be unaccustomed to thinking on your feet, especially in front of others. Fourth you are in competition with others.

The observer-auditor in you can function as an efficient stress-relief valve in such a situation. You mentally stand apart both from yourself and your panel of interlocutors. Then you focus on the question(s) and formulate your solution in sweet and detached serenity.

By disengaging from the fear-inducing, stress-producing emotions that are common during interviews, you can act—rather than react —with composure, clarity, and concentration. Whether or not you get the scholarship, promotion, or job, reducing your stress levels alone would make the observer-auditor paradigm worth adopting.

4.7 Interactions with others

In debates, discussions, seminars, etc., you will interact with others as an academic co-participant. If you are your own observer-auditor, you will not be carried away by rude behaviour in the heat of the moment, but rather will be in control of yourself, as arguments are fought and won on the basis of ideas and their strength, and not on the loudness of voice or the crassness of speech. Such temperate conduct will win you like-minded friends and also a larger circle of admirers. Overall, you will gain respect and respectability as a civilized and genteel person.

If this polished behaviour is internalized to become your normal conduct, you will be a well-adjusted member of society and a go-to resource person for your family, friends, peers, and other social circles.

4.8 Ethical dividends

The observer-auditor paradigm has applications beyond the academic, embracing much of life itself. Let us consider a contrived example.

EXAMPLE: FOREKNOWLEDGE OF AN EXAMINATION PAPER

Suppose you saw, lying open and unguarded due to some happenstance, the examination paper for a forthcoming examination. What would you do?

Either curiosity or temptation could instigate you to steal a wee look at what questions the examiners have set. There is an unethical underpinning to this action. It gives you an unfair advantage over all your classmates who did not or could not get the peep you got. Would that trouble you?

The observer-auditor within you would warn you well in advance to steer clear of such tempting revelations as a Faustian bargain that is best avoided. ★

You might say that I am just alluding to that shrill inner voice—*the conscience*—that all of us have. Yes, indeed, I am. That voice of conscience is what I am calling the observer-auditor. Only, the word conscience is used in the context of right and wrong when confronted with a *behavioural* dilemma. The value-laden word "conscience" is not appropriate for ensuring error-free problem solving in mathematics. So, I have instead chosen the more widely applicable, neutral term observer-auditor.

Perhaps by now, you are getting to see that the observer-auditor is not such a cockeyed idea after all, but is something already known to humankind as conscience, the inner moral compass that guides us to behave correctly, as long as we do not ignore it.[2]

Perhaps the greatest intangible but inwardly palpable benefit from the observer-auditor paradigm is the approval of your own self.
You will live in harmony and comfort with yourself.
And that is something worth cultivating assiduously.

Summary: Become Your Own Observer-Auditor

- To become your own observer-auditor in mathematics do this: as you solve a problem, after every few lines, take a *detached* look at your working and scrutinize it for errors. This way, you stop errors from propagating because you catch them as soon as they are made.
- Split yourself into two independent personae: one performing the action and the other reviewing it.
- Put enough distance between yourself and the work being checked so that you do not gloss over errors.
- Apply this idea to your written English as well. Ensure that it reads well both silently and aloud.
- Practise becoming your own observer-auditor until it becomes second nature to you.
- The observer-auditor paradigm is useful in academic discussions, oral examinations, and interviews for scholarships and jobs.
- This habit of separating a part of yourself to witness and hear what you do will also steer you toward ethical behaviour.

[2] An ignored conscience will often retire into silence.

PART B

MIND

13

Learning from Failure

Synopsis

Failure is part of the learning process and a natural stepping stone to success. Every failure provides valuable feedback on what you are doing wrong, and how it should be corrected. Do not get fixated on failure. Rather concentrate on the necessary corrective action. Learn from failure and then forget failure.

Give up all negative emotional baggage associated with failure—like fear, doubt, and despair—and treat it simply as a feedback mechanism, which is all it is. Let go of all past regrets, shames, sorrows. This clears the way for success.

Give up tension. Relax. Learn from mistakes. Do not repeat them. Give up negativity. Become positive. Keep trying until success is achieved. Practise positive visualization and affirmation, seeing yourself as already successful in your mind's eye. Aspire to and achieve the "being" stage of learning.

Failure is inherent in all academic research. Do not personalize failure by blaming either yourself or your peer reviewers if your manuscript is rejected. Use the review instead to improve your submission, and try again.

A person who never gives up can never fail.

13.1 Failure is a stepping stone to success

What is a chapter on "Failure" doing in a book that has "Success" in its title? Well, failure is a stepping stone to success, that's why. We are indoctrinated during our upbringing that failure is bad and success is good. Yet, there is no one who has succeeded without failing, nor anyone who has always failed, without ever succeeding.

All human learning takes place by trying, failing, and trying again and again, until success is attained. This is how we learn to walk and talk, to swim and cycle, to read and write, to add and multiply. In the long run, the successful person learns as much, if not more, from failure as he or she does from success.

13.2 Failure in early life

Everyone's early life, from infancy onwards, is peppered with failure that impels them to success. I go back to my favourite example of a baby learning to walk. Walking is a tall order when a baby cannot even turn from a supine to a prone position. When that first battle is won, it is time to toddle. Then, when the legs get stronger, it is time to practise standing up. Only then is walking attempted. And each stage brings with it a large number of failures before success is achieved. *But when the baby succeeds, it forgets the failures and keeps on succeeding thereafter.* This too, should be our formula for dealing with failure.

Learn from failures. Try until you succeed. Then forget past failures.

13.3 Coping with the emotional fallout of failure

If we had the pliable mind of a baby, we will simply forget all past failures the moment we succeed. Unfortunately, as we grow older, we take on the burdens of a personality. Success and failure then become a reflection of who or what we are. We become sensitive to how we are rated by our peers. We care about what others would think of us if we fail. Or we silently crave their acclaim when we succeed. This emotional baggage compounds the stress of failure and enhances the allure of success.

Life is not an Olympic event held once every four years with three medals of different colours given to only the top three competitors. *Life*

is a process of continuous learning. Once you realize that learning, rather than peer approval or adulation is the goal, your attitude to failure will change.

If you have learned the lessons from failure, you have actually succeeded.

If you are heartbroken by a failure that shatters a dream, and you need to release the pent up grief, do so in a welter of tears at an appropriate time and place, perhaps in the company of family or a sympathetic, trusted friend. You will feel much better afterward. Having released the emotion, do not allow it to build up again. Say farewell to grief and welcome the next opportunity to succeed. Stay determined.

Focus your efforts on what you need to do to avoid making the same mistake(s) again.

To assist those who find it difficult to let go, the following sections address both the need to let go and the art of letting go in some detail.

13.4 The need to let go

Any traumatic event leaves its emotional trace in your being. The more you dwell on past trauma, the deeper it gets entrenched in your mind. This applies to anything negative from something physical like slipping on a banana peel, to something mentally anguishing like failing an examination, to something personally devastating like losing a dear member of your family. While you might think that the grief of bereavement is "noble" whereas the pain of failure is "shameful", in reality, the emotional residues lodged in your being from either are just as corrosive to your peace.

Any stored negative emotion from past events can rob you of your peace at anytime. Only by letting it go can you regain your peace of mind.

I once read that we need to forgive, not so much for the benefit of the other person, as for our own benefit. If you accept the validity of this viewpoint, you will realize that every negative emotion that you capture from an unhappy past event and keep sealed within your heart has the potential to re-emerge and taunt your peace and steal your happiness. By harbouring it and giving it safe haven within your psyche, you are punishing yourself, not the party that you feel aggrieved by. So, why would any logically-minded person cultivate such a punitive and negative habit?

If you find it silly to harbour negativity like this, you are on the road to freedom. Sometimes, you might find it hard to let go, regardless of all the logic in the world. What would you do then? Let me illustrate with an example very relevant to the subject of this chapter.

EXAMPLE: FAILURE IN MATHEMATICS

Suppose you failed an examination in mathematics in high school. The shame and torment arising from it have wedged this event securely within your psyche. Each time you think of mathematics, this unhappy memory would bubble to the top and torment you afresh. Each reminder more deeply entrenches the past failure. With each recurrence, mathematics and failure are associated ever more strongly in your mind. You have begun to fear mathematics and have started doubting you could ever shine in it. One day you begin to believe in the inevitability of failure each time you *think* of mathematics, let alone *take* the subject. How did this pernicious state of affairs come about? *By unthinking repetition of a destructive memory.* ★

★

By repeatedly playing back a poisonous memory you have unwittingly bequeathed it ever greater power to ruin your life.

13.5 The art of letting go

The way out of this tangled mess is to cut the Gordian knot. Ruthlessly cast out all corrosive emotions.

There is no virtue in tormenting yourself by mindlessly playing back the memories of past shames and failures.

You must let go. Sometimes you will so stubbornly feel that you are right that you will refuse to let go. Indeed, you might view "letting go" as conceding defeat to whatever event or person you have your quibble with. That is utter foolishness. By not letting go, you are embracing defeat. *For your own sake, learn to let go.*

The moment you are willing to let go, you can instantly exorcise and excise the burden of past failure, shame, fear, guilt, sorrow, etc. But you must wholeheartedly, willingly, and sincerely cast out the feeling with a clear attitude that you will not sabotage yourself by letting it recur. Your emotional healing will then be complete.

There are dozens and dozens of self-help books and websites that teach you how to let go of those stored-up negative emotions. Some use the term *releasing* for the act of letting go. You can do it with affirmation and breathing, or by some ritual, or by a concerted act of will, or by potent visualization. Use any one or more of these methods.

Realize that you are not the emotion. You are not the shame. You are not the fear. You are not the guilt. You are you. Nothing can take away even a smidgen of your precious self.

My intent here is not to school you into how to let go. I am keen to impress upon you the absolute necessity of letting go so that the sweet waters of success may bathe your life. Learn to let go. Unburden yourself. Cast out all fear, doubt, shame, guilt: indeed all negativity. Dissociate yourself from your past failures.

You are not a failure. You can never be a failure. For the simple reason that the failure is not you. You are you.

13.6 Positivity feeds success

Positivity and negativity are choices you make. They determine whether you habitually succeed or habitually fail. It is not so much the circumstances of your life or upbringing as much as your habits of thought that propel you to success or failure.

Negativity is an accomplice of failure and spawns feelings of fear, doubt, guilt, despair, etc. These in turn undermine your self-confidence and performance, robbing you of success. Each failure reinforces the negativity that led to the failure in the first place. A vicious circle is established: negativity engenders failure, and failure reinforces negativity, as illustrated in Figure 13.1.

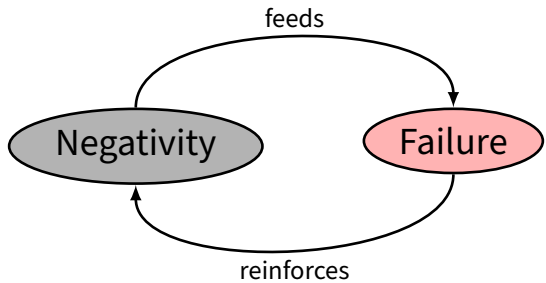


FIGURE 13.1: Negativity feeds failure, which in turn reinforces negativity.

The negativity-failure couple becomes self-sustaining and self-fulfilling. You then accept the label that you are a failure and descend deeper into its dungeon of gloom, despairing ever to succeed.

Dissociate yourself from all negativity. Then alone will you be ready to embrace success.

The best weapon to disrupt this vicious circle is a sunny disposition. Cultivate a positive attitude of mind. *Believe that what you think becomes your reality sooner or later.* If you practise optimism, you will one day *realize* that you alone are the architect of your destiny. To extricate yourself from the vicious dual stranglehold of negativity and failure, practise positivity, which leads to success, as illustrated in Figure 13.2.

Even if at first, you meet only with failure rather than success, keep on trying. Never lose your positivity. Each time you fail, analyze what went

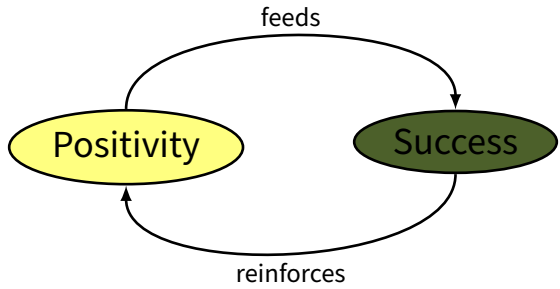


FIGURE 13.2: Positivity feeds success, which in turn reinforces positivity.

wrong. Failure will then stimulate fresh hope. Correct and retry. Redouble your efforts. Positivity in turn will stimulate renewed application to achieve success. Plough the field of failure to plant the seeds of success.

By nourishing those seeds with positivity, you are bound to succeed.

An

indomitable will and a habitual

positive attitude are the magic ingredients for success in all fields.

13.7 Positive visualization and affirmation

We have already touched upon visualization and affirmation in Chapter 11. It is such an important practice that it bears some repeating here in the context of failure. Apart from putting in the effort needed to master some skill or knowledge, you should also practise positive visualization or affirmation.

Olympic athletes are taught to visualize themselves doing perfectly what they are supposed to do at the Olympic Games. Olympic swimmers or gymnasts will be trained not only to swim or perform gymnastics, but also to *imagine* or *visualize* their swimming or executing the gymnastic routine perfectly. This mind's eye training helps produce Olympic champions.

You can do the same. Work at whatever have set for yourself. At the same time, visualize yourself as *already having perfected* whatever you are trying to master, whether it be doing mathematics, presenting a seminar, breezing through your examinations, or becoming proficient in Web searches. Effort and visualization will together work wonders. Repeated visualization will actualize whatever you are imagining.

Likewise, you can practise affirming with words whatever you are trying to master. Suppose you wish to write flawless English essays: you might try saying "I can write flawless English essays" or "I have mastered English essay writing". Note that you do not use words like "try" or "attempt" in these affirmations. There is no room for doubt. *Instead, you affirm that reality which you wish to actualize.*

Your subconscious mind accepts as truth the thought you are feeding it—through visualization or affirmation—and effortlessly manifests it in your life.

Practise positive visualization and affirmation without ceasing until whatever you desire actually comes to pass.

13.8 If at first you fail, try, try again

Failure is not the end of the world. Some of the most successful people in the world have been those who were *undaunted by repeated failure.*

EXAMPLE: THE LEGEND OF ROBERT THE BRUCE

Keep in mind the legend of the Scottish king Robert the Bruce, who while hiding after losing in battle six times, saw a spider attempt to spin a web. It failed six times in succession, but as the fascinated king watched, the spider went on to spin the web successfully on its seventh attempt. He took heart from the spider's example and redoubled his efforts at battle, winning, and reigning as monarch. ★

Alfred, Lord Tennyson ends his famous poem *Ulysses* with these memorable words:

> …that which we are, we are,
> One equal temper of heroic hearts,
> Made weak by time and fate, but strong in will
> To strive, to seek, to find, and not to yield.

That last line—"To strive, to seek, to find, and not to yield"—was adopted as the motto of the Outward Bound movement [**outwardbound**]. Make it your personal motto as well.

You cannot fail if you never give up!

13.9 The importance of small successes

Success motivates like nothing else. It is the supreme encouragement. Use little successes to build up larger victories.

Break a large task into smaller ones. Whether it is learning swimming or the anatomy of the brain, break the task up into smaller, more manageable chunks. Then focus on *one* small chunk. Try and try again until you succeed at it. Once you do. move on to another. In this fashion, build up your "bank account" of successes. March confidently from small successes to large ones.

13.10 Life support systems: family and friends

Solace at times of disappointment or failure is a healing emotional balm. It help us to cope and to hope. Family and friends are a life support system who can help lift us from the muddy mire of despair into the bright sunshine of renewed hope and resounding success.

While you should not be an emotional leech on those who love and support you, do not err on the other side and desist from asking help when necessary. The sooner you vanquish failure, the better for everyone. So, seek help early.

Most of all zoom out of the storm clouds of moodiness. Navigating out of confining moods might be the ultimate Houdini trick that you need to master. Use every resource you can access to propel yourself out of pernicious moods. Once you master your moods, you will find success so much more within your grasp, like a trained dog awaiting its master's bidding.

13.11 Patience is indispensable for success

Patience is indispensable for success. Cultivate patience. The dictum to try unceasingly until you succeed is vacuous without patience. There is a famous legend about a yogi called Milarepa who lived in Tibet. He was told by his teacher to build a house. After he had built it, his teacher told him to pull it down, return the rocks and stones to their places of

origin, and start again on another house. This was repeated twice. Finally, the teacher asked Milarepa to build a fourth and final building: a nine-storey tower. Milarepa obeyed unflinchingly on each occasion. In the end, having passed all the tests, Milarepa succeeded in his spiritual quest. Patience itself waits upon on such a one, as indeed, does success.

Each time you feel impatient with yourself, your circumstances in life, a problem you cannot master, or a skill that eludes you, remember Milarepa. Become an embodiment of patience. You cannot but succeed.

13.12 Do not repeat the same mistakes

Failure is usually the result of a cascade of errors. But making mistakes is part of learning, and repeating the same mistakes once or twice is part of the learning curve that leads to success. But what you need to guard against is repeating the same mistakes all the time, because that is a symptom that learning has not taken place.

Errors are common in the first three stages of learning: "naming", "knowing", and "doing". Here are some examples to illustrate how mistakes may be made and how to avoid repeating them.

For example in the "naming" stage, you might confuse a bacterium with a virus, because you know that they both can cause illness, but cannot recall how they differ. Such errors are easily corrected by reference to textbooks, or lecture notes, or a reliable Web source.

If you cannot fix in your mind the differences between a virus and bacterium, try making up a mnemonic *to highlight the differences, in terms that have meaning for you.* Test your knowledge a week later and see if you can remember correctly. If not, revisit the issue and try another technique—perhaps a visual one—like a table, an octopus diagram etc., either alone, or along with a mnemonic, as discussed in Chapter 10. Work patiently at it until the gross and subtle differences between a virus and bacterium are safely and durably locked away in your long term memory.

In the "knowing" stage, you might encounter similar difficulties of confusion, or of simply being unable to recall a fact or method, etc. For instance, say you are learning English as a foreign language, and you do not know the correct verb form of the verb "to be" that goes with the first person singular pronoun "I". In short you do not know if it should be "I be", "I am", "I is", or "I are". The best way to overcome this type of knowledge deficit is to *immerse* yourself in a sea of spoken English. Then,

you will *know* that it is "I am". It is futile to use logic in such a situation to figure out the answer because language, pronunciation, and spelling are not algorithmically or logically consistent, but rather are artefacts of history and usage.

In the "doing" stage, you might slip many times because of lack of practice. Whether you are learning to skate on ice, or are trying to translate textbook symptoms into a diagnosis in real life on a real patient, or are trying to prove a theorem, there is no guarantee that you will get it right the first time. As always, practice makes perfect.

Practice until you achieve that ease which comes with mastery.

Practice is the best antidote to failure in the "doing" phase of learning because it makes success second nature. You yourself will know that you know, when you master the "doing" stage of learning.

13.13 Aspire to the "being" stage of learning

The thralldom of failure is palpable in the first three stages of learning. But failure dare not peep at you when you reach the "being" stage. So, aspire always to that expert level. Think of a high-flying eagle effortlessly gliding on the air currents, cruising majestically with nary a flap of the wings. That is the image you should have of the "being" phase of learning. That is mastery. When you attain that, you have indeed succeeded.

Work hard at any subject until you attain that finesse which is synonymous with the "being" stage of learning.

13.14 Failing gracefully

By milking failures for lessons, you can leverage failures to yield success. Often, the lessons learned during failures are more valuable than the correct answers. In our personal lives, in business, in the laboratory, and in many other circumstances, success is not guaranteed despite our most assiduous efforts.

In such circumstances, fail gracefully and learn the lessons from failure effectively.

"Failing gracefully" is an expression familiar to computer programmers. It is impossible for a programmer to anticipate the multitude of real-life conditions under which a computer program might fail. Accordingly, the program is so written that it will work correctly under certain assumptions, and fail *gracefully* if those assumptions are not met. This means that the program will not crash the computer, or cause loss of data, or interfere with other programs that are running. Most importantly, your hard disk will not be wiped out because a single program has failed.

Failing gracefully is a very constructive attitude toward life in general and learning in particular.

Failure teaches us what to avoid, how to avoid it, why to avoid it, when to avoid it, etc. Failure inspires renewed effort to achieve what has not been attained yet. But failure cannot and should not cause loss of self-esteem, self-loathing, or other self-destructive tendencies. In no case should any failure cause your "hard disk to be erased".

13.15 Failure and research

Research is different from learning in that you are engaged in discovering new knowledge rather than becoming familiar with what is already known. Nothing worthwhile is gained without effort. And much of the effort in research is to keep alive the flame of the quest in the face of repeated failure. While funding is one prerequisite for research, being able to cope sensibly, courageously, and creatively with failure is another. There is no researcher who has never encountered failure in his or her work. Patience, will power, tenacity, and faith in yourself, and in your approach to the research are all essential for success.

Preparing a manuscript for publication and coping with its rejection are discussed in detail in **??**. Whether as a postgraduate student or researcher, never give up when you are attempting to publish a paper. Many famous scientists who went on to win Nobel Prizes have had their

prize-winning papers rejected when they were first submitted. Cultivate a dogged determination to succeed, but do not take rejection of your submissions personally. Neither hate yourself for having failed to publish, nor denounce or denigrate the reviewer(s) for not recommending your manuscript for publication.

Do not personalize failure. Analyze why you failed objectively. Correct errors. Try again. Repeat until you succeed.

If you dread failure, you cannot do research. If you are hypersensitive to others' criticism of your hypotheses or methods, you are unsuited to research. Become expert at taking failure in your stride, turning criticism to advantage, revising assumptions, fine-tuning methods, taking on board advice from research colleagues and benefactors, and attacking your problem with a new viewpoint, patiently with creativity and intuition. Success in research will be yours.

13.16 Parting words

Use failure as a pole to vault to success. Be patient. Do not lose hope. Try and try again. Never give up!

Summary: Learning from Failure

- Failure is part of learning. It is a feedback mechanism. You cannot learn without failing.
- Once we have learned to walk, we forget early failures like falling down when learning to walk.
- Forget the failure and focus effort and energy on what needs to be mastered.
- Do not repeat the same errors.
- Give up all negative emotions like fear, doubt, despair associated with failure.
- Negativity and failure are accomplices. Deliberately give up all negativity.
- Cultivate positivity which leads to success.

- Regardless of how many times you have failed, try again and again. Success is bound to be yours.
- Practise positive visualization in which you imagine yourself effortlessly succeeding at whatever you are tying to master. Your visualization will become your reality.
- Positive affirmation that you have already succeeded will likewise manifest the success you seek.
- Do not personalize failure. This is especially necessary in research.
- If your research manuscript is rejected, use the reviewers' feedback to improve your submission and try to get it published once more.
- If you never give up, you can never fail.

PART C

FOUNDATIONS

15

English as a Language

Synopsis

Language is by far the most distinctive and transformative achievement of humankind. It has allowed us to progress from the cave to the city and to enjoy all the attendant benefits of that evolution.

All languages are instruments of communication. And they are all built upon the triad of grammar, vocabulary and usage. Grammar enforces structure, and through it, unambiguous communication. Vocabulary provides the word-bricks used to build a language. Usage is the influence of style on both grammar and vocabulary, and varies with time and place.

English and Mathematics enjoy widespread acceptance and are the two languages we deal with in this book. English is both spoken and written whereas Mathematics is principally written. Both languages are evolving and expanding within their respective domains, and richly reward those who master them.

The student who wishes to master the English language should listen, speak, read, write, and think in English to gain rapid proficiency in it. Guidelines are given here to help achieve this.

> The limits of my language means the limits of my world.
>
> LUDWIG WITTGENSTEIN, Austrian-British philosopher, (1889–1951)

15.1 The wonder that is language

Language is an instrument of human communication. We use it whenever we listen, speak, read, write, and think. A moment's reflection should convince you that languages are by far[1] the most *distinctive* achievements of human beings.[2]

Language defines our very identity. Creative freedom has allowed languages to evolve and vary with time and clime. The dazzling variety of languages that exist is testament to the endless human talent for invention.

Not only is language the most distinctive of human creations, it is also the most *transformative*.[3] It has allowed us to communicate, compete, cooperate, coalesce, and consolidate into the terrestrial civilization that we are today.

Indeed, if not for language, you would not and could not be reading this book. Like life, breath, fresh air, and sunshine, language is an underappreciated but magnificent bounty we all enjoy.

15.2 English as a universal language

In 1687, Sir Isaac Newton[4] published his three-volume magnum opus, *Philosophiæ Naturalis Principia Mathematica*.[5] It was written in Latin.

The *Principia*—to use its short name—has been called the most important book in the history of science. It transcended the linguistic and national boundaries of its time and was accessible to the intelligentsia of all Europe. This was because Latin was the common language of the learned at that time.

Today, English performs much the same function as did Latin in the past. Not only is it the language of scholarly and scientific discourse, it is also the language of trade and commerce. And it is the common language

[1] Hyperlinks are coloured. This one leads to an online definition. Follow it to enlarge your vocabulary.
[2] The languages used by other creatures are imposed upon them by Nature.
[3] Both English and Mathematics are human languages.
[4] This hyperlink points to a life of Newton, available on the Web. Explore such links to expand your knowledge.
[5] Latin for *Mathematical Principles of Natural Philosophy*.

of international civil aviation, to name just one area where lives literally depend upon correct use of the language.

English is the closest to a universal language that we have at present. Regardless of where you live and what you study, a good command of English will help improve your academic prospects.

15.3 Grammar, vocabulary, and usage

The edifice of language rests on the tripod of *grammar*, *vocabulary*, and *usage*. Together, they confer upon language the structural integrity and functional consistency necessary for clear communication.

15.3.1 Grammar

Grammar is the *foundation* of language. Grammatical rules governing number, tense, case, and gender dictate the *structure* or *syntax* of what you write. The logic behind grammar enforces *correct, unambiguous communication*.

15.3.2 Vocabulary

Words are the *bricks* of language. Each word has its own nuanced meaning, which befits it better for some tasks than others. A good vocabulary affords you the luxury of choosing—from a large array—the best word(s) for your purpose. The *meaning* conveyed by the words you use—*the semantics*—is determined by your mastery of vocabulary. Vocabulary is treated in-depth in **??**.

15.3.3 Usage

Usage is the *style* or *fashion* of the language you use, not unlike architectural features or flourishes on a building. It is less rigid than the rules of grammar, or the meanings of words, and yet, it impacts upon both. It is governed by the times in which the language is spoken and written.

We instantly and instinctively recognize a style, whether in clothing, buildings, print, or language, and can effortlessly distinguish between a dated fashion and a contemporary one. New usage often emerges stealthily by unspoken convention as "the done thing", often flouting existing grammatical rules in the process. Usage is the focus of Chapter 33.

15.4 Learning English the hard and easy ways

Many, for whom English is not their native tongue, go to great lengths to learn its grammar. They learn how to analyze and synthesize sentences. They struggle with active and passive voice. They contend with prepositions and idioms. They memorize the quirks of English spelling. In short, they expend a great deal of time and brainpower for what are often meagre results. This is the hard way to learn English.

The easy way to learn English is the way you learned your mother tongue: by a process of immersion in an environment in which you are literally soaked in the language. You absorb the language osmotically. What you imbibe by listening you express through speech. It seems effortless. And it *is* effortless.

Grammar is secondary to usage. It matters not if you do not know what the subjunctive is. What matters is your ability to understand the spoken word, to speak fluently and confidently, to read with comprehension, and to write clearly and idiomatically. This immersion method takes time, but its results are far greater and more durable. Moreover, the process is so much more fun.

Listen. Speak. Read. Write. Think.

15.4.1 Listening

All languages have spoken variations or dialects. English is no exception, especially in the land of its birth. The English of the south of England is different from that of the Midlands. The Welsh, the Scots, and the Irish have all added their peculiar musical lilts to the language.

The Indians, the West Indians, the Latin Americans, the Germans, the French, the Dutch, the Italians, the Malaysians, the Singaporeans, the Australians, the New Zealanders, the Americans, the Canadians, the Kenyans, the Nigerians, the South Africans, the Egyptians, the Japanese, and the Chinese of Hong Kong have all put their own, unique stamp on the flavour of English they speak. The ubiquity of English has exacted a price: there is no single spoken English; there are only various flavours of the one language.

Take your pick of which flavour of English you would like to learn.[6] Listen to it as spoken by those who have mastered it. Gradually, you will understand their speech. Then, you will be able to speak like them. To help achieve this:

- Tune in to radio broadcasts where the preferred flavour of English is spoken. Listen to the news. Try to follow panel discussions. Listen to reports by journalists of repute.
- View documentaries and news bulletins in English on television or on the Web. There is a treasure trove of material that you can access online.
- Attend lectures, seminars, and discussions conducted in English to which you have ready access. Again, the Web is your treasury.
- Listen to audio books. Many audio books are freely available for listening at LibriVox.
- Watch English movies, with English subtitles, to enable you to tune in to the spoken word and attain proficiency in both listening and reading.
- Watch movies in your mother tongue with subtitles in English to develop comprehension and vocabulary.

15.4.2 Speaking

If listening is one side of the coin, speaking is the other. Start speaking English once you have listened to its sounds for some time. Do not wait until you have become an "expert listener". Language mastery comes with speaking as well as listening.

However hesitant you might be, *speak* in English. You cannot learn swimming while standing on land. You have to get into the water. Likewise, you will never speak English unless you *try* to speak it. Do not be self-conscious. You might speak the language haltingly or ungrammatically at first. Neither despair nor be deterred. There is no shame attached to learning. You will speak it fluently by and by.

Speaking improves with practice. Use every opportunity to converse in English. What others think of you is inconsequential. What you achieve by your own efforts alone matters. For that, keep on speaking English until you can do so naturally and without obvious effort.

[6] Beware of mixed tongues, where English is mixed freely with another language, as you risk speaking neither language in its pure form.

15.4.3 Reading

Once you can understand and speak English, start reading. By listening and speaking, you would already have learned proper pronunciation. It only remains to associate a pattern of letters with a sound. Read aloud. Read poetry. Go through Chapter 36 on Poetry. Progress to silent reading. Above all read with understanding. Part E deals extensively with reading; refer to it off and on.[7]

Just as listening and speaking are the obverse and reverse of the same coin, so too are reading and writing. As you read, so will you write. You must therefore choose good reading material, worthy of emulation.[8] Here are some hints on what to read:

- Good newspapers, whether paper-based or online, are excellent for starters. Alas, many are now behind paywalls. I have found to my dismay that even established newspapers put out material that has mistakes of omission, spelling, usage, etc. And tragically, newspapers nowadays are not necessarily purveyors of fact, but rather of opinion masquerading as fact. Accordingly, I make no recommendations here; use your own judgement.
- National broadcasters like NPR, the BBC, the ABC, and the CBC generally have good standards of English and reportage. They usually feature an eclectic mix of news and opinion, but always beware of bias—national broadcasters are not exempt! By browsing their websites, you will learn not only English but also how to think critically.
- Online and paper-edition current affairs magazines are an excellent source of good English provided you know where to look. You need to choose magazines which have good standards of English writing, and which also offer truthful, relatively unbiased opinions. I will not make any blanket recommendations; quality and probity can vary with time. Search out those that resonate with you and read them.
- Read book reviews in newspapers, like The Times Literary Supplement, and at specialist websites like the Los Angeles Review of Books, Kirkus Reviews, and goodreads. Then read those reviewed books that appeal to you on subject matter and quality. The reviews and essays at these

[7] "On and off" is equally acceptable. ☺

[8] Unfortunately, the democratization ushered in by the Web has meant that there are very many examples online of both of poor and good English. Use a good textbook to guide you to find out which is which.

websites are also usually an enriching read in themselves. You could also sign up for newsletters from such sites if you so desire.
- Visit your local library and see if you can borrow reading material suited to your stage of learning English. Ask the librarians for assistance if necessary.
- Shakespeare is the great bard of English. Read him and other renowned writers. Also read good translations of non-English authors. You will expand your habits of thought as you encounter new idioms and exult in the effervescence of fresh viewpoints.
- If you are studying English as a group or in a classroom, find out if you can exchange reading material with your fellow students. Share web links, or books, or periodicals. Enrich one another.

15.4.4 Writing

Writing is both a science and an art.[9] Writing well comes with careful reading and even more careful writing. The first step is to read well and read widely. We are all mimics when it comes to language. What we have read reverberates in our minds and ultimately finds expression as the spoken or written word. Cultivate a love for reading. You will automatically start writing better.

Maintain a diary in English. Recording your thoughts is a helpful practice, and doing so in English would be doubly helpful.

The more you write the better you will write. You will become internally sensitive to the flow, the rhythm, and logic of your own words and sentences. In time, you will know whether a sentence rings true as an expression of good English. Once you hit that "sweet spot" you will fall into a happy relationship with composition in English.

A good and ever expanding vocabulary is essential if what you write is to excite, entertain, rivet, inform, and educate your reader. Become friends with words.

Even if no one but you reads what you write, keep on writing. If you can get an instructor to review and correct your writing, so much

[9] See **??** and the paper by Gopen and Swan [**gopen**] for more on this.

the better. Pay attention to repeated patterns of mistakes—whether of spelling or usage—and correct them. Do not be discouraged even if you get poor marks. Never give up, but keep on trying. You *will* write good English eventually.

Always revise what you have written.

One whole part of this book, **??**, deals with writing. Refer to it as needed.

15.4.5 Thinking

When you have mastered listening, speaking, reading, and writing in English, you might gradually find yourself *thinking* in English. If you do, you have mastered the language. When you *think* in a language, you have become so habituated to it that it becomes second nature to you.

There are some who think more comfortably and effortlessly in a language other than English. That is fine. But you would then be transposing your thoughts from one language to another. Patterns of usage and idiom, vocabulary and syntax, style and grammar, all need to be translated, which is an additional burden. Ideally, therefore, you should be able to think in the language that you are using at any moment.

15.5 Resources

I have assumed that you are able to read and write English, i.e., that you have a working knowledge of the language, however rudimentary. If that is not the case, you may refer to the printed and online resources listed here to get you over that initial hump.

15.5.1 Textbooks and references

If you are looking to learn English from scratch, perhaps the best books to get you up and running are books that embody in their titles the words "English Through Pictures". I used one such book many hundred moons ago but that book is now sadly out of print. ☹

At present, there are two series of books with "English Through Pictures" in their titles. One is the two-volume set by Jonathan Crichton and Pieter Koster [**crichtonkoster1**, **crichtonkoster2**]. The other is the three-volume set by Richards and Gibson [**richardsgibson1**, **richardsgibson2**,

richardsgibson3]. While I have read neither set of books, they seem to have been well received by the community of learners they are intended for.

The above two series should impart enough knowledge on grammar, vocabulary, and usage to someone just starting out with English. If you need further help with English grammar, take a look at the two books by Raymond Murphy [**murphy2019**, **murphy2012**]. For more help on vocabulary and usage, refer to **??** and Chapter 33.

Surf the Web to find sites that can help you with English. Look for free online courses on learning English. If you learn visually, look for videos on a site like YouTube using a search phrase like "Learn English". The results you see will vary with your location in cyberspace, and the didactic quality might be variable. As with all matters on the Web, be wary, and confirm the correctness of the material you learn from, before you invest time and effort.

15.5.2 Helpful Q & A websites

There are many websites devoted to helping students learn English. Some are *forums* with a searchable *Question and Answer (Q & A)* format. Examples include:

- The English Language Learners Stack Exchange which is a member of the very useful Stack Exchange family of websites, each devoted to a specific subject area or specialist group. Explore these sites well as they are generally authoritative and helpful. This site is a beginner-level, friendly site.
- English Forward is especially useful if you are learning English as a foreign language. You might find volunteer helpers there who speak your native language, and are therefore attuned to your peculiar difficulties of understanding or usage.
- The English Language and Usage website is where more intricate questions on English are asked.

You would need to register before you can participate in most Q & A websites. Each site has its rules for good reason. Acquaint yourself with them and follow them. Benefit and be enriched.

[10] Sites scattered throughout the Web feature opinionated folk who exercise petty fiefdoms because they consider themselves experts. Just be aware that the Web is a reflection of humankind, warts and all.

The degree of courtesy extended to newcomers varies with websites.[10] Some sites are more welcoming and friendly than others. Find out those which agree with you. Follow site-etiquette always, but do not get deterred from asking for help just because someone somewhere once growled at you online. ☺

15.6 Looking ahead

This concludes the brief overview of the English language that is one of the two principal foci of this book. In later chapters we look at the skills needed to read discerningly, and to write persuasively.

Take a look at the chapters in Part E and **??** for further aid in the effective use of English. **??**, **??**, is particularly relevant. So too is Chapter 33, Mastering Word Usage.

SUMMARY: ENGLISH AS A LANGUAGE

- Language is the most distinctive and transformative human achievement.
- All languages are instruments of communication.
- Grammar, vocabulary, and usage underpin all languages.
- Grammar enforces logic and structure to allow unambiguous communication.
- Vocabulary provides the word-bricks used to build ideas with a language.
- Usage modifies both grammar and vocabulary to some extent, based on the time and place where the language is used.
- English is the closest to a universal language that we have at present.
- The easy and enjoyable way to learn English is to immerse yourself in an environment where it is used.
- Listening, speaking, reading, writing, and thinking are the five actions we need to perform, in that order, to gain proficiency in English.
- The rank newcomer to English can rely on generously illustrated textbooks of English to gain rapid familiarity and fluency in the language.
- The interested student should judiciously mine the Web to further her or his knowledge of English.

16

Mathematics as a Language

Synopsis

The two languages we are concerned with in this book—English and Mathematics—enjoy widespread acceptance. While English is both spoken and written, Mathematics is principally written. Both languages are evolving and expanding within their respective domains, and richly reward the student who masters them.

All languages are instruments of communication. And they are all built upon the triad of grammar, vocabulary and usage. Grammar enforces structure, and through it, unambiguous communication. Vocabulary provides the word-bricks used to build a language. Usage is the influence of style on both grammar and vocabulary, and varies with time and place.

Mathematics, being wholly logical, is less forgiving of errors of syntax and semantics. Nevertheless, it may be mastered by the diligent student who will then behold its silent, hidden beauty. This will help establish a lifelong friendship with the subject.

> The mathematician's patterns, like the painter's or the poet's must be beautiful; the ideas like the colours or the words, must fit together in a harmonious way. Beauty is the first test: there is no permanent place in the world for ugly mathematics.
>
> *A Mathematician's Apology*
> G H HARDY(1877–1947)

16.1 Mathematics *vis-a-vis* English

The primary purpose of any language is to facilitate *communication*. Whenever you listen, speak, read, or write, you are engaged in an act of communication. English and Mathematics are two universal languages which we have developed for specific purposes.

We are concerned in this book with both. English as a language has already been discussed in Chapter 15. Mathematics is introduced here as no less a language than English.

While English is one of many languages adopted by different people around the world for daily discourse, Mathematics is, by and large, *a single language*, universally used and understood, without significant variation, serving a specialist function: *the recognition of patterns*. Everything is viewed through the lenses of quantity, symmetry, shape, structure, and beauty[1] to reveal latent and patent patterns.

The fact that Mathematics is also a language should in itself allay any fears that you might have about it being vastly different from a spoken language like English. They are both means by which we may share "stories" of one sort or another.

The only major difference is that Mathematics is not so much spoken or listened to as it is written and read. Mathematics is silent, and much of its grandeur and beauty derives from this quality,[2] but this very reserve deters the student from befriending it easily.

16.2 Grammar, vocabulary, and usage

Much of what we said about English grammar, vocabulary, and usage in Chapter 15, also applies to Mathematics. Whereas English is both written

[1] Mathematical beauty has most often been compared to poetry and music, and ranks with them as among the noblest and most creative achievements of the human mind.
[2] English is like a river exhibiting both boisterous cataracts and placid flows. Mathematics, on the other hand, is like a glacier—silent, powerful, austere, deceptively mobile, and in its own way, breathtakingly beautiful.

and spoken, Mathematics is principally written rather than spoken.[3] Its similarities to English as well as its quirks are outlined below.

16.2.1 Grammar

Mathematics is a symbolic expression of concentrated and undeviating logic. It is therefore unsparing in its grammar, which cannot be flouted if communication is to be unambiguous. Mathematics boasts of a precision unparalleled in the annals of any language.[4]

Let us take a simple example of the addition of two numbers, accessible to all, and see what caveats might arise in its grammatical interpretation.

EXAMPLE: GRAMMAR: INFIX, POSTFIX, AND PREFIX NOTATIONS

Let us add the number 3 to the number 2 like so:

$$2+3=5 \tag{16.1}$$

This expression with an "=" (equals sign) is a statement of mathematical truth. It says that if we add 3 to 2, the result is 5. That is something all of us can agree upon.

The "+" (plus sign) is, by convention, the symbol we use to denote the action of addition. We can think of 2 and 3 as nouns being acted upon by the verb + to yield the resulting noun 5.

Let us now confine our attention not to the *truth* of Equation (16.1), but merely to the *act* of addition being performed on the left hand side, i.e., to:

$$2+3$$

The *notation* of interposing the verb between the two nouns is called *infix* notation. There are two other equally valid conventions to denote addition—*postfix* and *prefix*.

In postfix notation (also called Reverse Polish Notation or RPN), instead of $2+3$, we write

$$2\ 3\ +$$

[3] Except in primary school when we *recite* tables of addition and multiplication.
[4] Computer programming languages are a subset of mathematics and therefore exhibit the same unforgiving repudiation of syntactic errors.

where the two nouns come first followed by a verb. Because it acts on *two* numbers, we call addition a *binary* operation.[5]

In prefix notation (also called Polish Notation), we write

$$+\ 2\ 3$$

where the verb comes first followed by the two nouns.

With the latter two notations, the space between the 2 and the 3 might be small enough for the two numbers to be mistaken as 23, when the expression will fail to make sense, because the second number would then be missing. It is therefore no surprise that the infix notation—with less scope for ambiguity—is the one adopted in many contexts.

But the postfix and prefix notations have the major advantage that they are *parenthesis-free*.

For example, in the expression $(5+2)3$, we evaluate the term within parenthesis, namely, $(5+2)$ *first* and then multiply the *result* by 3 to get 21.

Because addition and multiplication are binary operations, in postfix notation, there are two numbers followed by an addition or multiplication sign. We start at the innermost parenthesis and work outwards. So, we write $5\ 2\ +$ and the result from this operation is multiplied by 3. So, the full postfix expression is $5\ 2\ +3\ \times$, which is both unambiguous and parenthesis-free.

Postfix and prefix notations have found use in early electronic calculators [**leachlegacy**] and some computer languages such as FORTH [**brodie1981**].

The point to take away is that despite being rigid, mathematical grammar has evolved to allow different accepted notations, all of which work flawlessly. One needs awareness of the context before making pronouncements of grammatical validity. ★

EXAMPLE: GRAMMAR: ORDER COUNTS

In English, the statement "The cat ate the rat" has the opposite meaning to the statement "The rat ate the cat", derived by transposing the two nouns—subject and object. This is because English is principally a non-inflected[6] language where word order can and does influence meaning.

[5] So too is multiplication.

[6] The non-inflected nouns *cat* and *rat* do not change their forms according to case (subjective or objective), unlike the inflected pronouns *I* (subjective) and *me* (objective).

Consider now two mathematical statements where the two nouns have been transposed:

$$2+3=5$$

and

$$3+2=5$$

Both are valid and true because addition is *commutative*—order does not matter.

But see what happens when we try the same thing with subtraction:

$$2-3=-1$$

and

$$3-2=1$$

Obviously the two statements give different results and are not equivalent. So, subtraction is *non-commutative*—order does matter. Therefore, we cannot always blithely transpose terms in a mathematical expression.

If you have not come across *negative numbers*, the first statement will seem nonsensical to you; and rightly so. But even then, it should be apparent that no sleight of hand will allow us to take away 3 from 2 and be left with something we can still count as we normally do. So, the negative number -1 is a new beast in the mathematical menagerie.

The ever-expanding empire of Mathematics has grown by fits and starts over several centuries, during which people grappled long and hard with "unnatural" ideas like negative and *imaginary numbers*, before they were gradually accepted and allowed into the mathematical fold. ★

16.2.2 Vocabulary

Mathematics is written rather than spoken and consists more of symbols and pictures than words. Its vocabulary is likewise largely symbolic and sometimes pictorial. It is this unfamiliar vocabulary that appears so forbidding to the budding student of the subject and induces what I have called "Mathophobia", which is considered in detail in **??**.

English expands by the addition of new words and phrases to capture novel ideas and situations; see **??**. Mathematics enlarges its domain by adding new mathematical concepts, objects, and their inter-relationships, with symbols to boot.

While every English word must be made up of the 26[7] letters of the alphabet, mathematics is composed largely of Hindu-Arabic numerals, English, Greek, and Hebrew letters, and a very large variety of symbols like "+, −, =" etc. Indeed, mathematical symbols may be and are invented according to need. This spontaneous expansion of symbols makes mathematics especially daunting; how does one comprehend symbols that are new and unknown? An example will illuminate.

These symbols had to be invented, agreed to, and adopted by practising mathematicians. They are now part of the common vocabulary of mathematics. Necessity and familiarity with these symbols makes friends out of strangers.

When the highly philosophical and logical Set Theory [**ferreiros2007**, **suppes1972**] was introduced in the late 1800s, it was initially criticized, but later recognized and adopted as being capacious enough to provide the foundations for a magnificent and unshakeable edifice of mathematics which was being rebuilt for the modern age.

Sets were simply given names of uppercase letters of the alphabet like A or B and the elements in them were named with lowercase letters like a or b. Operations between them, however, needed new symbols as tabulated in Table 16.1.

SYMBOL	MEANING	EXAMPLE
$\in$	Is an element of	$a \in A$ a is an element of set A
$\subset$	Is a subset of	$B \subset A$ B is a subset of A.
$\varnothing$ or $\varnothing$	The empty set	$\varnothing \subset A$ or $\varnothing \subset A$ The empty set is a subset of A
$\cup$	Union of two sets	$A \cup B$ The union of sets A and B
$\cap$	Intersection of two sets	$A \cap B$ The intersection of sets A and B

TABLE 16.1: Set-theoretic symbols with meanings and examples. Note that variations are allowed, as in the case of the empty set.

These symbols had to be invented, agreed to, and adopted by practising mathematicians. They are now part of the common vocabulary of mathematics. Necessity and familiarity with these symbols makes friends out of strangers.

The explosion in mathematical vocabulary, to deal with new concepts,

[7] Or 52, if you count uppercase as different letters.

means that almost no living mathematician has mastered the entire vocabulary. The price paid for unfettered mathematical expansion has been restricted specialization, not unlike in medicine. ★

16.2.3 Usage

We have seen above that as mathematics evolves—and more elegant, overarching concepts are discovered—new notations are invented to accommodate them. The result is greater conciseness in expression, or to greater power or breadth in dealing with concepts both novel and familiar. New vocabulary naturally leads to new usage.

EXAMPLE: USAGE: SYMBOL FOR THE IMAGINARY NUMBER $\sqrt{-1}$

When mathematicians first tried to solve the quadratic equation

$$x^2 + 1 = 0$$

they rightly concluded that there was no number known at the time that would fit the bill. After much hand-wringing and brain-wrangling, they decided to accept the existence of a new type of number whose square would be -1. Because this number was not real, it was called an *imaginary number*. Accordingly, the symbol i was assigned to represent $+\sqrt{-1}$, which is the positive square root of minus one.[8]

These imaginary numbers later found application in the real world for describing the relationships between currents and volt-ages associated with alternating current (AC). But electrical engineers had already enlisted the symbol i for electrical current. So, a convention was established that electrical engineers would use the symbol j in place of i to describe the unit imaginary number. This new usage avoided the possibility of confusion about what i meant in an electrical context.[9] ★

Usage evolves not only to avoid conflict of symbols, but also to accommodate newly forged mathematical concepts, usually accompanied by the added benefit of a more generic or concise notation.

[8] The Greek letter *iota*, written ι, is also sometimes used in place of i.

[9] However, the symbols j or J also denote current density. Given the finite number of alphabetic letters, we have to rely on context for meaning. But j as a legitimate representation of $\sqrt{-1}$ is here to stay.

EXAMPLE: USAGE: MAXWELL'S EQUATIONS

Vector notation was a new concept born in the late 1800s which led to a powerful unification of disparate mathematical ideas, as well as to a concise and elegant notation.

The great Scottish physicist, James Clerk Maxwell, had summarized the entire phenomenon of electromagnetism in a set of equations known popularly as Maxwell's equations [**maxwellsequations2019**].

What may not be equally well known is that Maxwell's original formulation consisted of *twenty* different equations [**rautio2014**]. Using vector notation, these could now now be reduced to *four* magnificently concise, almost poetic, equations couched using the arcane symbology of vector calculus, shown below for their symmetry and beauty alone, and not for comprehension: ☻

$$\nabla \cdot E = \frac{\rho}{\varepsilon_0}$$
$$\nabla \cdot B = 0$$
$$\nabla \times E = -\frac{\partial B}{\partial t}$$
$$\nabla \times B = \mu_0 J + \mu_0 \varepsilon_0 \frac{\partial E}{\partial t}$$

Once conciseness and power have been gained by a new mathematical usage, rarely, if ever, does one encounter the old usage again. ★

16.3 Beauty in Mathematics

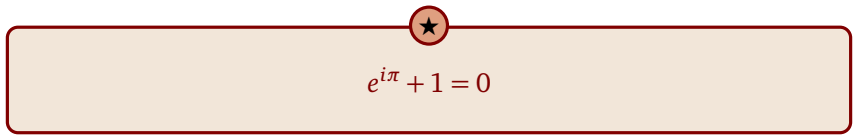
Mathematics, rightly viewed, possesses not only truth, but supreme beauty—a beauty cold and austere, like that of sculpture, without appeal to any part of our weaker nature, without the gorgeous trappings of painting or music, yet sublimely pure, and capable of a stern perfection such as only the greatest art can show. The true spirit of delight, the exaltation, the sense of being more than Man, which is the touchstone of the highest excellence, is to be found in mathematics as surely as poetry.

"The Study of Mathematics" in *Mysticism and Logic and Other Essays*
BERTRAND RUSSELL (1872–1970)

Recognizing mathematical beauty requires familiarity with the subject and some practice in its discipline.[10] When an elegant and unifying theorem

[10] See [**alvarez2017**] for an example where even non-mathematicians were found, by objective measurements, to appreciate mathematical beauty.

pops out at the end of a series of logical steps, it gives pleasure to the eyes of a mathematician.[11]



$$e^{i\pi} + 1 = 0$$

The above equation, known as Euler's identity, has been described as the most beautiful equation because it embodies in one expression the five most important mathematical quantities. Just as a jeweller has trained his eyes to identify a flawless gem, so too, the dedicated mathematician has accustomed himself to spot mathematical gems.

Beauty resides in abstract mathematics, pursued for its own sake. Equally, it resides in applied mathematics that is used in the real world. Both types of mathematics can and do embody beauty [**mathbeauty2020**] for they spring from the same source. Once you start appreciating the beauty of mathematics, the subject will seem less forbidding and more friendly to you. Develop this friendship and cultivate it for life. You will be enriched.

16.4 Looking ahead

This concludes the brief overview of Mathematics as a language. Refer to the five chapters on Mathematics in **??** for help with with the subject as you progress on your academic journey.

SUMMARY: MATHEMATICS AS A LANGUAGE

- All languages are instruments of communication.
- Grammar, vocabulary, and usage underpin all languages.
- Grammar enforces logic and structure to allow unambiguous communication.
- Vocabulary provides the word-bricks used to build ideas with a language.
- Usage modifies both grammar and vocabulary to some extent, based on the time and place where the language is used.
- While English has a finite alphabet from which its vocabulary is constructed, Mathematics takes recourse to unlimited invented symbols, strung together with logic, to convey its meaning.

[11] Sadly, Euler lost the sight in one eye, and later, in the other eye as well.

- Mathematics also embodies beauty to the beholder who can see it. Befriending the subject in this way will allay the fears that it usually inspires.

Part D

Study Techniques

32

Moving From Bs to As

Synopsis

Moving from Bs to As is simple: Find out why you are getting Bs. Determine what you should do to get As. Then, do it!

Ask, analyze, discuss, and introspect to find out why you are missing out on As. Three major factors impact your grades: knowledge, examination performance, and the pressure of time.

Slice the orange of knowledge with a different cut. Adopt for your weaker subjects those techniques that have led to A grades—for yourself or for others.

Read questions carefully, understand them correctly, and answer them precisely. Guard against incomplete answers. Practice on past papers.

Start early. Work steadily. Finish unhurriedly. Do not buckle or break under a heavy workload. Prioritize and pace your work. Hand in your best effort. Never give up.

32.1 Why do you want As?

Most people who get to university are more than happy if they manage to pass their examinations, even if only barely! If your motive in attending university is to get a degree that will enable you to settle into a good job and life, just passing your examinations might well suit your purpose admirably.

However, if you are one of those free spirits who is ever in quest of excellence, passing grades alone would not satisfy you. Nay, even Bs would not do. You seek As, or as the expression goes, *straight As*. You want to excel.

The reasons for this ambition could range from the thrill of topping your class each year, through wanting to do research in your chosen field, to a personality trait that simply does not accept anything but a superlative outcome in all your endeavours.

Whatever the underlying motivation, one thing is certain. You want As not Bs. If you are one of these students, read on, for this chapter is written especially for you, whether you are at school or university.

32.2 Why do you get Bs and not As?

To move from Bs to As, the glaringly obvious first question you need to ask is:

Why do I get Bs and not As?

What is it about your academic performance that has shackled you to Bs instead of freeing you for As? The key to transforming your grades from Bs to As lies within the varied answers to this overarching question in all its variations. I suggest some approaches below, but they are by no means exhaustive. Use them *and any others* that yield the precious answer-nuggets that you seek.

32.2.1 Ask

Ask more probing and detailed questions. Apply the W^7 framework of Chapter 22—*what, when, where, why, who, which, how*—to devise questions about why you are getting Bs and not As. They will help unearth the reasons why you are stuck at Bs.

Here is a sample checklist for doing this. Use these and other relevant questions to guide you to find the root causes for your lower-than-expected grades.

Asking Questions about Poor Performance

- Which? All subjects or only a few?
- Why? Phobias toward any subjects?
- Why? Wobbly subject knowledge, poor examination technique, time pressures, or a combination of these and other factors?
- What? Multiple choice, essay, or practical questions? Why?
- When? Only in examinations or in routine work as well?
- When? Early morning, late afternoon, or evening?
- When? After an illness or other personal issue?
- Where? Only in certain locations or everywhere? Why?
- Who? Any particular instructor or teaching style?

List 32.1: Asking questions about poor performance.

32.2.2 Analyze

Another approach is to analyze the data. You could fire up a spreadsheet and fill its rows and columns with hard and soft data relating to your subjects, examination grades, gut feelings before an examination, locations and times of examinations, durations of illnesses, etc.

Include whatever *in your opinion* might be relevant. Look for tell-tale patterns. Try to extract from the data a consistent picture that helps explain your results. Because no two people are the same, the answers you seek will be personal and customized to you.

32.2.3 Discuss

The third approach is to discuss the issue. The opportunity to bounce off ideas—in a discussion with friends or conversation with a mentor—helps greatly. Think of it as a Socratic dialogue with finding clarity as its end.

Example: Example

Seek out an instructor in one of the subjects where you dearly want to do better but have not. Take a recent assignment or examination paper as a template for your discussion. Fix an appointment for a half hour or so, and discuss candidly

why you did not soar higher in your grades. Walk away with something concrete that you can use to remedy your grades. ★

32.2.4 Introspect

There are certain subjective matters that only you can know and that only you can identify as causes for your failings. Reflect. Introspect honestly. Be frank. Be impartial. Do not wince at unpleasant truths—simply confront them matter-of-factly. Do not sabotage yourself with subterfuges and rationalizations. Become your own friend as you do some detective work on your academic performance.

EXAMPLE: EXAMPLE

For example, you might be a video game aficionado who is addicted to gaming. Or you might be spending too much time playing sport or a musical instrument at a time when you should be studying at full throttle for your examinations. Or you might spend too much time watching television or at the movies. Or you might fear a subject, or hate it so much, that you put off studying it. These are highly personal subjective factors known only to you. Identify and overcome them. ★

32.2.5 Conclude

At the end of this soul searching, you should have some clear ideas about what factors are responsible for holding you back in your grades. If you haven't got any clarity, relax and start over, until you do. Remember my advice from Chapter 13:

★

Never give up.

32.3 Knowledge versus performance at examinations

Examinations grade your performance. Knowledge underpins your performance. So, it is important that you know for yourself whether it is knowledge, or examination performance, or both, that are dragging you back.

By knowledge, I mean what you have *internalized* in your discipline. If you know which page of which book has what is needed to answer a question, but you simply cannot recall the actual information, then you

really lack the knowledge. Knowing where to find out what you need will mark you in later life as an educated person, but it will not transmogrify your Bs into As.

You may lay claim to something as *your own* knowledge only if it is *ready for recall* at the snap of a finger. And that is what counts at examinations.

Performance at examinations makes or mars your grade regardless of how much you know and how well you know it. Develop the ability to gauge for yourself, after the event, whether you have given of your best to any examination that you sit for.

Both knowledge and examination performance are dependent on the how much time you can lavish on them. The pressure of time impacts on both, and ultimately on your grades.

32.4 Moving from Bs to As

Once you have diagnosed the problem, you can dispense the correct remedy. In List 32.2, I have shown the three specific factors we have identified so far.[1] Each is dealt with in greater detail in succeeding sections.

MOVING FROM BS TO AS

1. Knowledge
2. Examination performance
3. Time pressures

LIST 32.2: Moving from Bs to As.

32.5 Knowledge

Because you are already a B student, your subject knowledge should be above average. If inadequate knowledge has been identified as a cause, you must home in on what precisely you need to learn better and how.

[1] This list is by no means complete. Find out for yourself what ails *your* grades using these ideas as a guide.

32.5.1 Wobbly knowledge

Have you mastered all your subjects or is your knowledge still a little wobbly? If you are weak across *different* subjects, it is more your study techniques that need to be improved rather than subject knowledge. Review Part D of this book, and use ideas from it like active reading, mnemonics, formulating your own examination questions, slicing the orange of knowledge with a different cut, efficient time management, regular revision, summaries, group study, etc., to establish your knowledge on an unshakeable foundation.

32.5.2 Weak subjects

What are the subjects you are weak in? Do you get Bs in all subjects or only in a few? Why are you weak in those subjects? Is it because of phobias, or a natural dislike for a particular discipline? Getting rid of phobias is like treating a disease. Just as you cannot claim good health until a basal infection has been eradicated, so also you cannot attain mastery of a subject until your phobias related to it are excised completely.

EXAMPLE: EXAMPLE

Many people have an unhappy relationship with Mathematics and develop mathophobia. In the five chapters in **??**, dedicated to mathematics, I have discussed overcoming mathophobia, explained the rationale behind the rules of arithmetic, emphasized carefulness when solving problems, and touched upon a whole host of other issues. While these are specific to mathematics, the principles in those chapters may be applied to other subjects as well. ★

32.5.3 Cross-fertilization

Do you get As in any subjects? Do you know why? Can you apply those same factors to your weaker subjects, to move from Bs to As? This approach is excellent if you have all As, except for one or two Bs which you want to convert into As as well.

If you are into group study, and have friends in your group who have got As in the subject of interest, and who are unselfish enough to share how they did so, find out what they did and apply those principles in your own work.

32.5.4 Slicing the orange of knowledge with a different cut

When you revise, use the technique of "slicing the orange of knowledge with a different cut" introduced earlier. Integrate your knowledge of a topic by linking it to other knowledge in that subject by purposely adopting a different perspective from your textbook or lecture notes. Chapter 22 and the companion website have several examples of this valuable study technique. It can help you master what has eluded you in the past.

32.6 Examination performance

Knowledge alone does not get you good grades. Examinations are the ultimate arbiter. They are so important that **??** of this book is devoted to examinations in their different aspects. Browse through and revise the chapters therein to refresh your memory on how to do well in examinations.

Do you perform badly only during examinations or do you get poor grades in assignments, term papers/projects, and tests as well? Is your performance stymied by time constraints? Do you panic? Is it because of poor time management? If so, read Chapter 24 and follow the suggestions there.

32.6.1 Misapprehension

Misunderstanding a question means that you invariably answer poorly and bag low marks for it. Diagnose why you do this.

Do you *consistently* misunderstand questions? If so, *why?* Is it due to an undue haste to write answers, brought on by nervousness? Or have you dallied for too long on one question, and squandered on it the time meant for other questions, leading to panic? Are you oppressed by the pressure of time?

Learn to read a question unhurriedly.

Let the question speak to you. Listen to it. Be silent and attentive. Cut out all mental chatter. Do not interrupt what the question is saying to you by putting together a preliminary answer in your mind while reading it.

You will have all the time later on to respond to the question. Read

?????? and **??** carefully and follow the suggestions there. In a nutshell: read carefully, understand correctly, and answer precisely.

32.6.2 Incomplete answers

Related to misunderstanding a question is answering it incompletely. You might think that you have answered a question fully when in fact you have carelessly left out some relevant details. It becomes perplexing when you get part of the marks instead of the expected full marks for that question.

I have given examples of unintended partial answers in **??**: see for instance **??**. Learn from these cases to be more careful when answering questions. Understand the question correctly and answer it completely and precisely.

32.6.3 Post-examination analysis

After an examination, compare your answers with the model answers. Identify what omitted facts or comments cost you marks. Take care not to repeat the same type of error in future. If you still cannot divine why you lost marks, seek a meeting with your instructor to find out why. Conduct your own "post-mortems" after examinations until you become expert at avoiding whatever costs you marks.

32.6.4 Not attempting the requisite number of questions

Attempt enough questions and all parts even if only partially.

Even a poor answer is better than none. Partial answers qualify for partial marks. An answer in point form is better than a blank line. You will get some marks and those marks will add up to a better grade in the end. Don't be like the dinner guest who preferred not show up than be late. The rules of an examination are different. Play by them.

32.6.5 Practicals and orals

Praxis-based subjects such as music and the performing arts, as well as the natural sciences, medicine, dentistry, etc., entail practical examinations as well as theoretical ones. You might also have oral or *viva voce* examinations in almost any subject.

Are you a student whose theoretical knowledge is sound, but who becomes nervous when confronted with a practical or oral test? Do your fingers tremble when you have to set up a practical experiment, or play some music, or examine a patient as part of an examination? Are you put off by having to face an examiner in a *viva voce* examination?

If so, you need to work the panic and nervousness out of your system. Becoming fearless takes time and practice. Be patient. Be persistent.

EXAMPLE: EXAMPLE

Suppose you are told to stand near a whiteboard, pen in hand, and asked to explain something to a group of examiners seated at a table. Your knees are weak and wobbly. Your mouth is dry. Words form in your head but not in your mouth. What should you do?

Take one or two deep breaths to calm yourself. Then think that you are a king and that the seated professors are your subjects. Have utter confidence in your knowledge and launch forth on your answer.

If the "king-subject" fantasy does not work for you, imagine something more outrageous: that you are an invincible lion and that the seated examiners are mice. Or use another analogy.

Visualize yourself in a position of utter dominance and mastery and start answering. You will find the results nothing short of miraculous.

One cautionary point though. Practise this mental attitude only during your oral examination. *Do not make hubris your habit.* In later life, even if you are the acknowledged world leader in your field of knowledge, let humility always be your ornament. ★

32.6.6 Time and place

If you know your material but get poor grades at examinations, analyze the pattern of examinations at which you did not do well. Do time and place have anything to do with it?

Do you do badly only at examinations held late in the day to allow working students to attend? Do *you* do badly at such examinations because you are tired after a hard day's work? Or is it afternoon examinations that bring out the worst in you, drowsy as you are after eating lunch? Did you have two examinations held back to back that left you too exhausted to do well in the second? Or was it only examinations held after you were

ill and a bit under the weather? By analyzing the patterns, you can put your finger on the cause, its degree of seriousness, and its remedy.

Is a particular examination venue associated with poorer grades than other venues? Did it have to do with toilets or temperatures? Are you superstitious? Do you feel less comfortable writing an examination at one venue than at others? Is your angst rooted in something physical or is it purely mental, based perhaps on past experiences?

Time and place of examination should *never* influence your grades. You cannot choose either and should be immune to variations in both. Refer to Chapter 8 to overcome mental obstacles like this.

32.6.7 Adequate practice

Answer at least one relevant past paper in each subject under timed examination conditions.

Do not wait for your instructor to get you going. Do it yourself. Lay your hands on a past paper, sit sequestered, and write the exam while timing yourself. After answering, get hold of a model answer script and grade yourself. Know where you stand, and how soundly, *before* the examination. If the results of your self-assessment are dismal, identify your weaknesses and practise until you eliminate them. See **??** for details.

32.6.8 Formulate your own examination questions

Pretend that you are your own examiner. Frame questions. Then answer them under examination conditions. Finally correct your answers and grade yourself. You will see clearly where you need to improve.

Do this frequently in each subject you wish to improve, as you study it. Keep these questions and answers for revision prior to the examination. The more you practise, the better you will become. Practise until examinations become a routine non-event in your mind.

32.7 Time pressures

The pressure of time pursues us all throughout our lives. Sometimes, we are acutely aware of it, as during examinations; at other times, not as much.

Overcome the panic brought on by the pressure of time during examinations by practising on enough past papers, by disciplining your allocation of time to each question according to the marks it is worth, by attempting the requisite number of questions, and by attempting all parts of answered questions, even if only briefly.

In the succeeding sections, I consider time pressures outside the scenario of examinations, and suggest how you should cope with them.

32.7.1 Procrastination and missed deadlines

Do you procrastinate? If so, work at eradicating this undesirable habit. See especially Chapters 2 and 24. Are you continually assessed in any subject? Do you miss deadlines for submission of term papers and assignments? If so, do you lose marks on that count? How serious a problem is it for you? Acknowledge and address missed deadlines and lost marks if they become habitual.

Begin early. Work steadily. Finish unhurriedly. Fulfil deadlines. ☻

32.7.2 Competing demands for time

You are a whole person and need time for family, rest, relaxation, recreation, chores like cooking, washing, etc., apart from academic tasks. Apportion your time sensibly.

Do a *time audit* of how you spend your time during a typical weekday, a typical weekend, and a typical week. Refer to Chapter 24, and especially Section 24.19 for examples and guidelines. If you find hobbies or recreation taking up large chunks of time, re-schedule your activities, according more time and a higher priority to your studies.

32.7.3 Workload

Even if you topped your school earlier, on entering an elite school or university, you might find yourself in competition with a student cohort that is so good that just keeping up takes all you can give it.[2]

[2]The movie *The Paper Chase* and the related TV series illustrates this in the case of law students who enter a top-notch US law school and find that they need to devise means like group study to cope with its demands.

Apart from the excellence of your fellow students, your elite institution itself might adopt the Spartan technique of winnowing out the weaklings by imposing a punishing—perhaps impossible—workload. Unless you are highly motivated, what started out as a much anticipated, joyous intellectual adventure could morph into a nightmarish Sisyphean imposition from which there is no escape. You simply have no time to finish all that you are required to do.

If you are in this situation, brace yourself. Do not buckle. Do not grieve. Do not pity yourself. Do not complain. Do not neglect your health or sleep. Simply and manfully confront the task. Affirm that you *will* accomplish. Take steps to succeed. As long as you do not give in you *will* prevail. Remember that you are in an elite institution in the first place because you *already* have excelled. What you have done before, you can do again.

Prioritize your work. Identify what is core or compulsory work. Distinguish it from the optional or elective material. Fulfil the core tasks first. Then attend to the optional work. Strictly enforce guillotines of time. Plan how much time you can give to each task and give it that much and no more. After you have dealt with the lot, give any spare time to whatever you think needs doing better.

Once you have got on top of your work, you will find the going so much easier. Without relenting, keep on top until you graduate.

32.8 In a nutshell

Grade repair from Bs to As is possible and highly likely if you identify the causes of your B grades and take corrective action. There are basically three major areas that you must address: knowledge, examination performance, and time pressures.

If all three have been tackled, and you are still lugging some B grades, you need to take a deep breath, put some metaphorical distance between yourself and your studies, and take a careful objective look at why it is still happening. Once you have found out *why* ask *what* to home in on remedial action.

Learning to diagnose and treat your own academic problems this way, on your own steam, is the surest way to prepare yourself for lifelong learning.

Summary: Moving From Bs to As

- Finding out why you get Bs rather than As is fundamental to improving your grades. Use the W^7 framework for this.
- Analyze the facts surrounding your examination grades and put it into a table or spreadsheet to discover patterns that might explain why, when, or where you do badly.
- Fix an appointment with an instructor and discuss a recent term paper or test—where you scored lower than expected—to discover causes and design cures.
- Apply the study methods given elsewhere in this book to strengthen your grasp of the material in subjects where your ready-knowledge is weak.
- Flush subject-phobias out of your system.
- Read carefully. Understand correctly. Answer precisely. Apply these dicta to routine as well as examination questions.
- Overcome panic at practicals and orals by visualizing and adopting a supremely knowledgeable dominant standpoint.
- Eradicate procrastination. Begin early. Work steadily. Finish unhurriedly.
- Manage your time sensibly. Accord and enforce priorities to all tasks.
- Move from Bs to As and keep on getting straight As.

Part E

Reading

36

Poetry

Synopsis

Poetry is a significant part of human thought and heritage. Your reading in any language is complete only when it encompasses the poetic masterworks of that language.

Cultivate an appreciation for poetry as it nurtures memory and creativity. Reading a poem aloud can be delightfully soothing because of its inherent rhythm and rhyme. Let poetry work its magic on you. Read the great poets who live on in their poems. Imbibe their inspiration. Emulate their mastery of language. Improve your vocabulary. Perfect the spoken and written word.

Above all else, learn to enjoy poetry, and thereby to appreciate beauty. You will be enriched and educated, and become a more cultured, refined, and sensitive human being.

> A poet is, before anything else, a person who is passionately in love with language.
>
> *The Complete Works of W H Auden: Prose, Volume II: 1939–1948*
> W H AUDEN, Anglo-American poet, (1907–1973)

36.1 Why Poetry?

Why is there a chapter on Poetry in a book devoted to helping you succeed academically? The reasons are several and I will list just a few here.

The first and most glib reason is that *I love poetry*. Call it an idiosyncrasy if you will. This chapter is accordingly more personal and opinionated than the rest of the book.

Secondly, most of us learn a new language using rhyme and song—just recall the nursery rhymes of your childhood—and poetry, at least in its more ancient forms, is rooted in metre and often in rhyme.

Thirdly, much of the enduring literature of the world—like the *Rāmāyaṇa,* the *Mahābhārata,* the *Iliad,* the *Odyssey,* the *Rubaiyat of Omar Khayyam,* Goethe's *Faust,* and Dante's *Divine Comedy,* to name but a few—is in poetic form.

Fourth, given its innate rhyme and cadence, melody and beat, poetry set to tune as song, is *memorable*, as evidenced by religious hymns, martial songs, national anthems, folk songs, etc.

Moreover, when you are trying to master a new language, your reading is never really complete until you have recited and relished poetry in that language.

Lastly, poetry is profoundly evocative and often exposes beauty that might otherwise have lain unseen. And appreciation of beauty is part of what makes you an educated person.

36.2 "The best words in their best order"

The English poet Samuel Taylor Coleridge, famed author of the fabulous poem *Kubla Khan,* called poetry "the best words in their best order" [**coleridge_poetry**]. When you wish to enrich your feel for a language, read its best poetry. Your command of words and phrases, your feel for rhyme and diction, your sense of what is right and what is wrong when using the language, will all improve.

Whether or not you become inspired and confident enough to pen your own lines of rhyme, I very much encourage you to *recite* the great poems you can lay your hands on. Your command of the language will improve immeasurably. Your confidence in using it will grow in leaps and bounds. You will also slowly learn to appreciate, in poetry, the beauty of some of the most abstract structures man has built with his intelligence.[1] Round off your reading every day with a little poetry. It will be like a truly satisfying dessert at the end of a meal!

36.3 Poetic distinctions

Poetry is language at its finest. There is an economy of expression, a richness of feeling, a profundity of thought, a musical lilt or rhyme, a measured cadence when read aloud, that endears poetry to all lovers of language. A simple phrase from Shakespeare like "Sleep that knits up the ravell'd sleeve of care"[2] is frugal, yet richly expressive and evocative.

If you have not recited poetry before, I heartily recommend that you try it.

Poetry enriches thought, feeling, and expression. Reciting poetry is exhilarating and educational. Not only would you be improving your vocabulary, you will be learning how to write better from the masters of the language in which the poem is written. Indeed, you might even learn some nonsense words!

36.4 Lewis Carroll's *Jabberwocky:* evocative nonsense

The English clergyman, mathematician, author, and poet, Lewis Carroll, wrote, as part of his book *Through the Looking-Glass, and What Alice Found There,* a poem called *Jabberwocky* [**jabberwocky**, **carroll**] that contains *nonsense words in English.*

For some strange reason, it was a poem that we had to learn as secondary school students of English Literature in Singapore. Our teacher, a diminutive New Zealander called Ms Elizabeth Phillipp, read the poem

[1] In this sense, I think Poetry, Music, and Mathematics represent the *greatest abstract* achievements of humankind.

[2] Even though this quotation is from the play *Macbeth*, II:2:48, I consider it consummately poetic, in the Coleridgean sense.