
AN INTRODUCTION TO CRITICAL THINKING AND CREATIVITY

Think More, Think Better

Joe Y. F. Lau

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PREFACE

This is a textbook on critical and creative thinking. It can be used as a course text or a self-contained study guide. Since there are many similar textbooks in the market, let me describe some special features of this book:

- Unlike most textbooks, I discuss both critical and creative thinking because they are equally important for problem solving and they are not independent of each other. We need creativity in critical thinking to come up with arguments, counterexamples, and alternative explanations. And creativity needs critical thinking in evaluating and improving new ideas. They are both part of the essential thinking toolkit.
- Good thinking requires not just knowledge of the principles of good reasoning. We discuss them of course, but personality and other psychological factors matter as well. This book emphasizes the importance of attitudes and practice for good thinking. We also discuss findings in cognitive science and psychology, such as cognitive biases in reasoning and decision making.
- Our thinking directly affects our life through the choices we make. These choices depend in part on our values and moral outlook. It is of utmost importance that we can think about these issues critically and impartially. I therefore include a chapter on decision making and another one on the foundation of moral reasoning.

- This book has a companion website: Critical Thinking Web. It is located at <http://philosophy.hku.hk/think>, and hosted by the Philosophy Department of the University of Hong Kong. The website includes many online tutorials that are used in schools and universities around the world. A special section is devoted to this book, which includes errata, additional notes and exercises, and further readings.
- This book is not an encyclopedia on thinking skills. It aims to be a short and readable text, providing the reader with a practical and sound foundation. I deliberately leave out a complete treatment of Venn diagrams and standard formal logic. Interested readers and teachers can consult the companion website for online tutorials on these topics.
- Useful facts and rules are often presented in bullet points to make them clearer. I also include many examples from finance and business to show how critical thinking is relevant to a variety of careers.

A note of warning: To make the text more readable and the sentences shorter, sometimes I simplify and leave out minor qualifications. I am also less strict with the use of quotations marks than I would otherwise be as an academic philosopher. Finally, many of the ideas in the book are not original. They come from other philosophers, psychologists, and experts in other areas.

Thanks to Tim van Gelder for his comments on my earlier book proposal. I also want to thank Lee Tien Ming and Jonathan Chan. I have learned a lot about critical thinking from all of them. I would also like to thank Executive Editor Stephen Quigley at John Wiley & Sons, Inc., and Assistant Editor Jacqueline Palmieri. They have been most patient even though I kept missing one deadline after another. On a more technical matter, this book was typeset with \LaTeX . It has made the whole project so much more efficient and enjoyable. Thanks to Donald Knuth, Leslie Lamport, and other contributors to the system. Finally, this book is the result of over ten years of teaching in critical thinking. My heartfelt thanks to the many generations of students who endured my classes and smiled politely at my jokes.

Joe Y. F. Lau

Hong Kong
January, 2011

CHAPTER 1

INTRODUCTION

1.1 THINKING SKILLS IN THE AGE OF GLOBALIZATION

Whether we like it or not, globalization is changing the way we work and live. First of all, we are increasingly faced with complex problems that affect the whole world, whether it is global warming, pollution, financial crises, or new epidemics. We need good thinking and creative ideas to coordinate efforts to solve these problems. At the personal level, globalization brings about an ever-quicken pace of life. We have a huge amount of information available, but what we learn today might easily become obsolete tomorrow. Although fast changes also bring new opportunities, we now have to compete with talented people across the world. To be successful in this environment, we need good thinking skills that can help us make reliable decisions and acquire new knowledge quickly.

But what do we mean by good thinking skills? Basically, it comes down to two things—critical thinking and creativity. Critical thinking is thinking clearly and rationally. It involves thinking precisely and systematically, and following the rules of logic and scientific reasoning, among other things. As for creativity, it is a matter of coming up with new and useful ideas, generating alternative possibilities. This book is about these two sets of thinking skills, but at this point, you might ask,

Which is more important, critical thinking or creativity? The short answer is that they are equally important. We need creativity to come up with ideas to solve problems, but we also need critical thinking to evaluate and improve these ideas. They complement each other, and we need both to survive and to prosper.

In this book we shall discuss critical thinking first, and come back to creativity near the end. As we shall see, there is a lot more we can say systematically about critical thinking. A critical thinker is someone who is able to do the following:

- Understand the logical connections between ideas.
- Formulate ideas succinctly and precisely.
- Identify, construct, and evaluate arguments.
- Evaluate the pros and cons of a decision.
- Evaluate the evidence for and against a hypothesis.
- Detect inconsistencies and common mistakes in reasoning.
- Analyze problems systematically.
- Identify the relevance and importance of ideas.
- Justify one's beliefs and values.
- Reflect and evaluate one's thinking skills.

As we can see from the list, critical thinking skills are essential for all sorts of careers in which we have to communicate ideas, make decisions, analyze, and solve problems. This is why critical thinking is called a *domain-general* thinking skill. But critical thinking is not just for the workplace. To live a meaningful life and plan for the future, we need to think about ourselves honestly and carefully. The Greek philosopher Socrates (469–399 B.C.E.) once said, “the unexamined life is not worth living.” One big difference between human beings and other animals is our capacity for self-reflection. We can examine the purpose and meaning of our life and change ourselves accordingly. Critical thinking contributes to this process of self-evaluation and transformation.

Good critical thinking is also the foundation of science and democracy. Science requires rationality in designing experiments and testing theories. A vibrant and progressive democracy requires citizens who can think objectively about social and political issues and are able to avoid biases and prejudices. So obviously the cultivation of critical thinking should be a central aim of education.

1.2 SOME MISCONCEPTIONS ABOUT CRITICAL THINKING

However, critical thinking is sometimes thought to be too confrontational. Some people think critical thinking means criticizing others all the time, which is not constructive. But this is a misunderstanding. Critical thinking is not a purely

destructive force. First, by rejecting bad ideas, we become better at finding the truth. Second, thinking critically does not mean we criticize people all the time. When other people are right, we don't have to disagree. And when other people are wrong, critical thinking helps us recognize the mistakes being made, but it does not follow we have to publicly denounce them. Sometimes mistakes do not matter. Sometimes we have to be polite, and sometimes we can help people reason better not by criticizing them but by other indirect means—for example, by giving hints and suggestions. A critical thinker can be sympathetic and constructive rather than confrontational.

Another objection to critical thinking is that it is not practically useful because people in real life do not listen to reason. They act on the basis of self-interest, emotion, or personal relationships. The first problem with this objection is that it confuses rational thinking with *talking* about reasons. It might be true that many people are irrational, and to influence them we need to appeal to authority, emotions, or anything other than reason. But we can still use critical thinking to think strategically about the best means to achieve our objectives.

The objection is also wrong in assuming that critical thinking is opposed to emotions, relationships, and so on. Consider for example love and friendship. They are certainly valuable, but critical thinking can help us cultivate them. For example, thinking carefully about what is good or bad about a relationship can help us improve it and make it more fulfilling. Besides, it is not always wise to act solely on the basis of emotions. They can be biased by ego, fear, and greed. Thinking more about our decisions can counteract this problem.

1.3 IMPROVING OUR THINKING

So how do we enhance our critical thinking if it is so useful? Obviously, we are all able to think critically to some extent, or we will not survive very long! But there is always room for improvement. Even with a skill as natural as running, training with an expert can improve our breathing and posture and help us run even better. Thinking is something we all do and take for granted, but the fact is that even normally intelligent people can sometimes be stubborn and biased. Psychology research tells us that people make lot of mistakes in their reasoning—they overestimate their abilities, interpret the world to confirm their prejudices, and look for causes and patterns in the wrong places. By studying critical thinking, we are more likely to avoid such errors. We can also help other people by studying critical thinking. Sometimes we get the feeling that an argument is wrong but we do not know exactly why. Critical thinking gives us the concepts and vocabulary to explain what is wrong. This promotes understanding and more effective discussions.

Good critical thinking is a cognitive skill. In general, developing a skill requires three conditions—learning the theory, deliberate practice, and adopting the right attitudes. By *theory* we mean the rules and facts we have to know in order to possess the skill. For example, one cannot be a good basketball player without

knowing the rules of the game—for example, kicking the basketball is not allowed. Likewise, thinking critically requires knowing a certain amount of logic. However, knowing the theory is not the same as being able to apply it. You might know in theory that you should balance the bike when you are cycling, but it does not mean you can actually do it. This is where practice comes in, because it translates your theoretical knowledge into actual ability. However, your attitudes make a big difference as to whether your practice is effective and sustainable. If you hate playing the piano, forcing you to practice is not productive in the long run.

1.3.1 Theory

Let us now look at the theoretical knowledge required for good critical thinking. It can be divided into five main areas, and in this book we shall discuss all of them:

1. **Meaning analysis:** Explain ideas clearly and systematically; use definitions and other tools to clarify meaning and make ideas more precise.
2. **Logic:** Analyze and evaluate arguments; identify logical consequences and inconsistencies.
3. **Scientific methods:** Use empirical data to test a theory; identify causes and effects; probability theory and statistics.
4. **Decision and values:** Rational decision making; critical reflection of value frameworks and moral judgments.
5. **Fallacies and biases:** Typical mistakes of reasoning and the psychological traits likely to cause such mistakes.

Naturally you will find some topics more interesting than others. But whether we are learning martial arts or the piano, there are basic techniques we have to master. They might be boring, but they form the foundation of more advanced techniques. The same is true of critical thinking. Some theories and principles seem rather dry and abstract, but I hope you will appreciate their power and relevance to everyday thinking once you understand how they can be applied.

1.3.2 Practice

Psychologists have discovered a 10-year rule when it comes to acquiring a skill. It takes about 10 years of intensive and structured practice—around 10,000 hours of practice—to reach world-class level in a certain area, even for a talented individual. This rule is supposed to apply to all kinds of expertise, whether it is sports, music, chess, writing, or scientific research. Even a genius prodigy such as Mozart spent years practicing musical instruments and writing lesser pieces, under great pressure from his father, who was himself an outstanding musician. Many of Mozart's childhood compositions were arrangements of works by other composers, or they were thought to be partly written by his father. His piano con-

certo No. 9 (K.271) is perhaps the earliest original work that is highly regarded by critics. But by then Mozart had already been composing for over 10 years.

Years of early training and dedicated parents are two typical themes in achieving world-class performance. Tiger Woods has been one of the most successful golf players of all time. His father, Earl, gave him a sawed off a golf club to play with when he was 9 months old. When Tiger was 18 months old, Earl started taking his son to the golf course, and a coach was hired when Tiger was 4 years old. Earl continued to train his son, and just over 10 years later in 1991, Tiger became the youngest ever U.S. Junior Amateur Champion.

Of course, it is probably unrealistic to expect all of us to put in the same amount of effort solely into improving our thinking. But what empirical research tells us is that good thinking does not come for free. If we are serious about improving our minds, we have to come up with a plan and be ready to spend a lot of time training. Just reading this book is not going to be enough. You also need to do the exercises and apply your knowledge to your daily life. Critical thinking should become a natural habit, a way of life, rather than something you do occasionally.

How do we turn critical thinking into a natural habit? Here is a simple and practical method for you to try out. We call it *the fourfold path to good thinking*. To follow the method, we make it a habit to ask these four basic questions about the ideas we come across:

Question	Issues to think about
<i>What</i> does it mean?	Are the keywords and the main concepts clear? Can the ideas be made more precise? How is it related to other things? Any examples to illustrate what is meant?
<i>How many</i> supporting reasons and objections?	List the reasons for and against the claim. Count and evaluate these reasons. Think about both sides of an issue. Any counterexamples to the claim?
<i>Why</i> is this important or relevant?	What are the major consequences? How does it affect people? Is it useful? Is it surprising? Have I learned something new and interesting?
<i>Which</i> are the other possibilities to consider?	What other information might be relevant? Any similar cases to think about?

These questions look simple, but they are actually quite powerful because they introduce a good structure to organize our analysis. As an example, suppose we are discussing whether it is wrong to eat (nonhuman) animals. Here is how we might apply the fourfold path:

1. The first question—what does it mean?—is about clarifying the key concepts so that we can understand more clearly the claim under discussion.
 - What do we mean by *animals*? Dogs and chickens are obviously animals. But what about fish, oysters, insects, bacteria? Is it also wrong to eat them? Where do we draw the line?
 - If eating animals is wrong, how wrong is it? As bad as killing people?

2. To carry out the second step of the fourfold path, we list all the reasons for and against the claim under consideration.
 - Arguments against eating meat might include: animals have rights, animal farming create a lot of suffering, and it is more efficient to use land to grow vegetables than to raise animals.
 - Arguments on the opposite side might include: farm animals exist because of us and so we can do what want with them, and humans are more intelligent than animals.
 - It is always a good idea to be able to *count* the number of arguments. For example, three arguments in support and two against.
 - Think about both sides of an issue. Even if you think eating meat is fine, you should try your best to come up with opposing arguments. You will gain a deeper understanding of your own position and be able to defend it better.
 - Evaluate the arguments on both sides. What seems to be a good argument might turn out not to be the case on further reflection—for example, why can we eat animals just because we are smarter? Does it also mean adults can eat babies and intelligent aliens can eat human beings?

3. The third step of the fourfold path is to consider whether the issue is important. Does it really matter what the correct answer is? What are the theoretical, social, personal, or political implications?
 - How would the world be different if more people give up meat?
 - How important is this question compared with other issues such as poverty and starvation?

4. The last step is to explore alternative possibilities and further issues.
 - Does the level of intelligence of the animal make a difference?
 - How about eating animals raised in a happy environment and killed in a painless manner? Is this also wrong?
 - What about eating animals that die naturally? What if we can grow meat from stem cells and eat meat without killing animals?

As you can see, although the fourfold path consists of four very simple questions, they help us examine an issue in depth from different perspectives. To improve your thinking, use this method often in your daily life, when you read magazines, surf the web, watch TV, or chat with others. You will become a more sophisticated, systematic, and creative thinker.

Critical thinking and investment

The idea that we should think critically might seem downright boring, and yet we should not underestimate the power of critical thinking. It requires having the discipline to reflect on the reasons for our actions, and this is very important if we want to improve ourselves and become more successful. Warren Buffet is one of the world's richest persons, widely admired for his investment record and philanthropy. The adherence to critical thinking is a crucial factor in Buffet's success. Here is what he says about the importance of being able to give reasons for our actions:

You ought to be able to explain why you're taking the job you're taking, why you're making the investment you're making, or whatever it may be. And if it can't stand applying pencil to paper, you'd better think it through some more. And if you can't write an intelligent answer to those questions, don't do it.

I never buy anything unless I can fill out on a piece of paper my reasons. I may be wrong, but I would know the answer to that. "I'm paying \$32 billion today for the Coca-Cola Company because ..." If you can't answer that question, you shouldn't buy it. If you can answer that question, and you do it a few times, you'll make a lot of money.

Making money might not be our top priority, but if we can apply the same discipline in giving reasons for our actions and think about these reasons carefully, we are more likely to achieve our goals.

1.3.3 Attitude

If you enjoy an activity and believe it is important, you will probably put in more effort and pay more attention to your performance. Similarly, there are positive attitudes that are more conducive to good thinking:

- **Independence of thought:** Good thinking is hard. Some people just want to know the answers rather than work it out themselves. Others have no patience for abstract or complicated ideas. A good thinker is able to think independently and go against conventional wisdom if need be.

- **Open-mindedness:** A good thinker looks at the evidence objectively, and is willing to suspend judgment or change her opinion depending on the evidence. This is not a sign of weakness. An open-minded thinker is not dogmatic. She is willing to admit mistakes, think about new possibilities, and will not reject new ideas without good reasons.
- **Cool-headedness and impartiality:** Good thinking does not require giving up emotions. But we should avoid letting our feelings overwhelm our reasoning. For example, it is difficult to think straight if you get angry easily when other people disagree with you. Fair and objective evaluations help us make better decisions.
- **An analytical and reflective attitude:** Do not jump to conclusions. A good thinker is one who spends time to analyze an issue systematically and carefully and to actively search for arguments and evidence on both sides. She is interested in learning more about her own strengths and weaknesses to improve her performance.

These attitudes are crucial for good thinking, but they are more a way of life than a piece of theoretical knowledge. They have to be internalized to become part of our natural habit and personality. This is easier said than done! Good thinking takes a lot of time and effort. But look at it this way: If we are willing to change ourselves when most people don't, this gives us the opportunity to excel and become better than average.

EXERCISES

Note: Suggested answers are at the end of the book, except questions that are marked with ☒.

1.1 This is a passage from the management best-seller *In Search of Excellence* (Peters and Waterman, 1982, p. 108). Can you summarize the argument against intelligence and logical thinking? Is it a good argument or not? Explain your reasons.

If you place in a bottle half a dozen bees and the same number of flies, and lay the bottle horizontally, with its base (the closed end) to the window, you will find that the bees will persist, till they die of exhaustion or hunger, in their endeavor to discover an opening through the glass; while the flies, in less than two minutes, will all have sallied forth through the neck on the opposite side. ... It is the bees' love of flight, it is their very intelligence, that is their undoing in this experiment. They evidently imagine that the issue from every prison must be where the light shines clearest; and they act in accordance, and persist in too-logical action. To bees glass is a supernatural mystery. ... And, the greater their intelligence, the more inadmissible, more incomprehensible, will the strange obstacle appear. Whereas

the featherbrained flies, careless of logic ... flutter wildly hither and thither, and meeting here the good fortune that often waits on the simple ... necessarily end up by discovering the friendly opening that restores their liberty to them.

1.2 Do you agree with these remarks? Explain your answers.

- a)** Critical thinking is too negative because we are always trying to find fault but this is not a very healthy attitude.
- b)** Critical thinking is not very useful because personal connections and relationships are more important for success.
- c)** We often have to make decisions very quickly without a lot of time to think. So critical thinking is not really that useful.

1.3 Here is another definition of critical thinking from Scriven and Paul (1987). How would you compare this definition with the one in this book?

Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness.

1.4 Apply the fourfold path to the following claims and list the issues and questions you should consider.

- a)** It is always better to have more choices.
- b)** Buying stocks is a good investment because the stock market always goes up in the long run.
- c)** It is not wrong for a person to commit suicide rather than to suffer through a painful terminal illness.

1.5 Here are some questions for you to reflect on your thinking attitudes. Which of them are true of you?

- a)** I can improve my thinking skills further.
- b)** The purpose of thinking is not to be right all the time.
- c)** I am not afraid to try out new ideas.
- d)** Thinking takes time and might not be easy.
- e)** I do not enjoy thinking about complicated ideas.
- f)** Thinking is boring and it is better to spend time doing other things.
- g)** Thinking is easy. I just use my gut feelings to make up my mind.
- h)** The point of giving reasons is to show people that they are wrong.

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CHAPTER 2

THINKING AND WRITING CLEARLY

Do you believe in UFOs? According to a poll in 2005, 34% of Americans do. In 2007, Japanese Cabinet Secretary Nobutaka Machimura caused quite a stir when he said on TV that UFOs “definitely” exist. But before you answer the question, pause and think about what UFO means. It is actually an abbreviation for “unidentified flying object.” In other words, if there is something in the sky and nobody knows what it is, then it is an UFO. On this interpretation, there are certainly plenty of UFOs, but they could have been weather balloons, atmospheric reflections, and so on. Of course, UFO can also mean an alien spaceship. If this is what is meant, then it is not so clear that there are any.

This example shows that when the meaning of a claim is unclear, it might be impossible to say whether it is true or false. Two people might disagree about the existence of UFOs, but the disagreement is pointless if they are using the term to mean different things. Being clear helps us avoid such verbal disputes. The UFO example also illustrates a crucial habit we should cultivate if we want to become a better thinker—before accepting a claim, pause to think about what it means and whether we understand what it says. We are bombarded with sound bites and slogans every day, and we should avoid accepting them uncritically.

Consider the popular idea that the economy should be a free market without government interference. Before deciding whether we agree or disagree, we need to clarify what a free market is and what counts as interference. For example, surely companies are not free to harm people. But then what about regulating pollution or monopolies? Would investment in education and research count as interference? What about supporting arts and culture or disadvantaged minorities such as the disabled? Once we start thinking about these issues, we begin to realize that a totally free market is undesirable. The real issue is not whether, but how, the government should regulate the economy.

Although we should try to improve the clarity and precision of ideas, this is not an absolute rule. Sometimes there is no need to be clear. We do not need to understand the physics of microwave radiation to use a microwave oven. What is important is that *we can explain things clearly when we need to*. But what kind of skills do we need to be able to think and communicate ideas clearly? We are going to discuss two methods below: enhancing our sensitivity to literal meaning and making connections between ideas.

2.1 LITERAL MEANING

To begin with, we ought to be able to identify the **literal meaning** of a statement and distinguish it from its **conversational implicatures**. Literal meaning is a property of linguistic expressions. The literal meaning of a sequence of words is determined by its grammatical properties and the meanings that are conventionally assigned to the individual words. For example, the literal meaning of *bachelor* in English is “an unmarried man”. The phrase *I cannot be happier* literally means it is impossible for the speaker to be more happy than he or she is right now.

On the other hand, the conversational implicature is the information that a speaker implicitly conveys in a particular context, distinct from the literal meaning of what might have been said. Someone who looks at the windows and says, “It is cold here,” might be suggesting that the windows be closed. But this message is distinct from the literal meaning of the statement. Similarly, the phrase *I love books* seems to say that the speaker likes reading, but strictly speaking that is again not part of the literal meaning. The sentence is still true if the speaker does not like to read but loves to collect books as a form of investment or to show off.

Of course, good communication skills require sensitivity to conversational implicatures or related clues such as body language. But we should also be able to use literal meaning to convey ideas directly and explicitly. First, it helps us avoid misunderstanding. Second, the truth of what we say generally depends on literal meaning and not the conversational implicature. Suppose I tell you, “I shall try to come to the meeting.” This reply is similar to “I will come,” but with a significant difference. If I use the first sentence and I fail to show up, I can at least say I tried but could not make it in the end. But if I use the second sentence, I will have made a promise, and failing to show up implies that I have broken my promise and said something false. So if you care about truth and promises, you should care about

literal meaning. This is particularly important in law, when it comes to interpreting legislation and contracts. Take the following two clauses for a rental contract. They look similar, but they differ in literal meaning. Which version should you use for your lease if you were a prospective tenant?

1. You may terminate the lease after 12 months by giving 2 months' notice.
2. After 12 months, you may give 2 months' notice and terminate the lease.

This example illustrates an important technique in clarifying meaning. One way to explain differences in literal meaning is to identify their different logical implications. The first clause implies a lease that lasts for a minimum of 12 months (if you give notice to leave the apartment at the end of the 10th month), whereas the second one implies a minimum lease of 14 months. Obviously, if you are renting an apartment you want more flexibility and to have the option to move out as early as possible if you need to. So the first clause is preferable. As you can see, attention to literal meaning can clarify our rights and duties and help us avoid unnecessary disputes and nasty surprises later on.

Attention to literal meaning is useful in other contexts as well. For example, as consumers we are naturally concerned about the safety and quality of our food, and to make informed choices we need to paying attention to the meaning of food labels. Nowadays lots of foods are supposed to be low-fat, but *low-fat* does not imply low-sugar or low-salt. Food with “no artificial flavors” can contain preservatives, and “hormone-free” chicken might be injected with lots of antibiotics. Interesting enough, the American food company Tyson at one point was selling chickens advertised as “raised without antibiotics” when in fact the chicken eggs were injected with plenty of antibiotics before they hatched! The company insisted that they had not advertised falsely, because “raised” literally applies only to the bringing up the chicks *after* they have hatched. Whether you agree with this definition or not, it tells us that those who are concerned about food safety have to be very careful about the meanings of food labels.

2.2 CONNECTING IDEAS

Albert Einstein (1879–1955) once said, “If you can't explain it simply, you don't understand it well enough.” Many people are attracted to obscure ideas that they cannot explain. They think the ideas are profound, and they might well be right. But it is often just an illusion. To avoid such self-deception, we should ensure that we can explain our ideas clearly and systematically. The way to do it is to connect our ideas to other ideas. The following sections present some typical methods.

2.2.1 Give examples

Understanding words and concepts through examples is central to learning—think about how children learn words like *red* and *vegetables*. Being able to give your

own examples is a good sign that you understand a concept well enough to apply it. Concrete examples are good for illustrating abstract concepts. The speed of light is about 300,000 kilometers per second. This number means nothing to most people. But explain that at this speed you can go round the world seven times in one second, it suddenly becomes very impressive.

Choose your examples carefully in your writing and presentations. Vivid and unexpected ones create a deeper impression. Personal stories that your audience can relate to will make your message seem more relevant. Contrasting or opposite examples are also useful, as in explaining why a rule applies in one situation but not another.

2.2.2 Definitions

Definitions can go further than examples in explaining the full meaning of a term. Why are human beings and cows examples of mammals, but fish and turtles are not? You need a definition of *mammal* to explain why. Definitions are also useful in removing ambiguity and making meaning more precise. (See Chapter 3 for further discussion.)

2.2.3 Identifying implications

To explain theories, proposals, and rules, we can point to their distinctive consequences. In other words, we explain how they make a difference if they are correct or accepted. For example, utilitarianism is the moral theory that the right thing to do in any situation is to choose the action that will maximize the greatest happiness for the greatest number of people. What does that mean? It means we should make more people happy rather than just ourselves. But it also implies that the interests of a small minority can be sacrificed if this will make the majority happier. Similarly, scientists say global warming might lead to a 5°C increase in temperature by 2100. To explain this further, we can list the dire implications, such as rising sea levels, disappearing glaciers, global water shortages, and one third of all species being threatened with extinction. Understanding the consequences of a theory allows us to see its significance and connect it to other ideas.

2.2.4 Compare and contrast

Understanding something implies knowing how it is different from other things. To explain how sentences *P* and *Q* are different in meaning, find a situation in which one is true and the other one is false, as in the rental contract example earlier. Similarly, you can explain the differences between concepts by showing that they apply in different situations. Take *speed* and *acceleration*. Acceleration is the rate of change of speed. Something moving at a very high speed can in fact have zero acceleration if the speed does not change. Similarly, an object can have a high acceleration if it changes speed very quickly, even if the final speed is very low. In law, there is a difference between *charitable* and *non-profit* organizations.

All charitable organizations are non-profit, but non-profit organizations need not be charitable. Roughly speaking, charitable ones must be for the benefit of the general public. So a club that aims to benefit only certain private members is not charitable, even if it is not for profit.

2.2.5 Breaking things down

To understand how a complex system works, we can look at its parts and how they interact with each other. A mechanic fixes a car by checking the functions of different parts and see if they fit together properly. A wine buff evaluates a wine by focusing on the different aspects of taste, color, smell, and texture and their balance.

Similarly, we can explain an idea more clearly by breaking it down. For example, in this book we explain good thinking in terms of critical and creative thinking. We then define critical thinking as clear and rational thinking, and we can explain clarity and rationality further. A general idea is broken down into smaller concepts, and the smaller concepts are broken down even further, like a tree trunk leading up to the main branches and then smaller and smaller branches. Organizing ideas like a tree has many advantages. It makes them easier to understand and remember. It also helps us adjust the level of details we want to provide in our explanations to other people. We can start with the ideas at the top level, and go down further and further depending on the audience and the time we have. Some people are incapable of explaining anything without launching into a 10-minute speech. But an intelligent person with a deep understanding is just at ease giving a 10-second explanation as a 10-minute one.

2.3 FIVE TIPS FOR EFFECTIVE WRITING AND PRESENTATION

Good communication is not just about using words with the right meaning. We also need to think about how ideas are packaged in a way that is attractive and easy to understand. It would be a pity if you put in a lot of effort but still fail to convey your important ideas. The basic rule is simple enough—*make sure that your ideas are simple, organized, and relevant to your readers*. It is easier said than done, but improving our writing and presentation can improve our critical thinking as well. Here are five general guidelines.

Tip 1: Know your audience

Focus on the points your audience will find interesting and relevant. We can communicate more effectively and leave a better impression. Ask yourself these questions:

- How much does the audience know about the topic? Are they professionals or lay people, or both? Provide the appropriate level of information.

- What do they expect from you? Is your goal to entertain, to inform, or to demonstrate your knowledge? What would the audience be most interested in? Facts, diagrams, predictions, practical advice, or personal stories?
- Should you consider any special requirements about the format? Should you provide handouts? Use a projector? Provide a summary? Is there a word or time limit?

Tip 2: What is your central message and why is it important?

It is an open secret that people who listen to a talk quickly forget most of it. The same goes for students attending lectures. When people remember things, it is because they find something interesting, useful, or funny. So think carefully about the main purpose of your presentation. Is there a take-home message? Focus on it and deliver the message clearly. If everything is important, then nothing will stand out as important. You need to make a choice about which idea to emphasize. If people are going to spend part of their lives listening to you or reading your work, which is the one thing you can point to in order to show that they have not wasted their time?

In particular, learn how to formulate a **thesis statement** for presentation and writing that is analytical in character—that is, involving analyses, arguments, or explanations. The thesis statement is a claim that summarizes the most important point you want to make. Suppose you want to write an essay explaining that people worry too much about radiation from mobile phones. Somewhere near the beginning of the essay you should write down your main point. It sets the tone of the essay and shows the reader what he or she might expect later on. For example, this can be the first sentence of your introduction:

Many people believe that mobile phones emit dangerous radiation, but there is to date no convincing evidence that mobile phones cause cancer or other serious health problems.

Later on in the essay you can then say more about how worried people might be about this issue and what the relevant scientific studies say. Ideally, your thesis statement should be informative and attract the attention of your reader. (See the companion website for further discussion.)

Tip 3: Organize your ideas

Good writing takes time to ferment. Always begin with some research and analysis before you start typing out the real thing. Read widely and collect data, diagrams, photos, arguments, articles, and web pages and whatever else might be relevant. When you have collected enough material, think about their connections and the proper order of presentation. Develop the habit of using a point-by-point outline to organize your ideas, where each point might be a concept or a short sentence. The outline helps you distill and organize your ideas.