1 Chapter 1: Reasoning and Critical Thinking

1.1 Reasoning

It is important to distinguish mere thinking, i.e. a sequence of unrelated thoughts, from reasoning, in which case one thought directly leads to another. The active process of reasoning is called inference.

**inference:** When we infer B from A, we move from A to B because we believe that A supports or justifies or makes it reasonable to believe in the truth of B.

Words that indicate that one thought is intended to provide support for another thought are called *inference indicators*. The main examples of inference indicators are:

- since
- thus
- implies
- consequently
- because
- it follows that
- given that

It should be noted that inference indicators are not always present.

Whenever we express a thought, we do so by means of *statements*. A statement is a sentence that is used to make a claim that is capable of being true or false. So, questions and commands are not statements. Statements are the basic units of arguments. An *argument* is a set of statements along with the claim that one or more of those statements, called the *premises*, supports another (particular one) of them called the *conclusion*.

It is important to distinguish *arguments* from *explanations*. An *explanation* is a set of statements along with the claim that a particular one of them (what is being explained), called the *explanandum*, is true because of the others, called the *explanans*. Thus, in an explanation we begin with the knowledge that a particular statement is true. Now we can see the difference between explanations and arguments: In the case of an explanation we take a single statement and look for reasons why it is true and, in the case of an argument, on the basis of one or several statements (the premises) we infer another statement (the conclusion). The process of reasoning follows the following scheme in the two cases:

**Explanation:**

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Explanandum
   ↓
Explanans 1 -- Explanans 2 -- Explanans 3
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**Argument:**

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Premise 1 -- Premise 2 -- Premise 3
   ↓
Conclusion
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1.2 The Concept of Logical Strength

Since an argument is always making a claim that its premises support its conclusion, the assessment of an argument requires that one assess this claim. Do the premises really support the conclusion, and if so, how much support do they provide? Thus, we want to ask the question: How strong is the argument? The strength of an argument is determined by the degree of logical strength that it possesses.

**logical strength:** An argument has logical strength when its premises, if true, actually provide support for its conclusion.

Notice that the (logical) strength of an argument does not depend on the truth of the premises. An argument is (logically) strong if when we suppose the premises are true, then the conclusion follows (or is made more reasonable). Thus, logical strength is a structural characteristic of an argument.

Logical strength comes in degrees. Some arguments are so strong that if the premises are true, then the conclusion is guaranteed. Such arguments are called deductive arguments. Mathematical proofs are examples of deductive arguments, since they constitute strict proofs. In most cases, however, arguments are not this strong. Usually, if the premises are true, then the conclusion is made more reasonable (or probable). In such arguments, the truth of the premises will increase your degree of belief in the truth of the conclusion. Arguments with this property are called inductive arguments. In the case of inductive arguments there are always possible states of affairs in which the premises could be true and the conclusion false, but this is not the case with deductive arguments.

It should be emphasized that if an argument lacks logical strength then it does not imply that the conclusion is false or that the conclusion is less likely to be false. If an argument lacks logical strength then it means that the premises, even if they are true, provide little or no reason for us to believe that the conclusion is true.

2 Truth, Logical Strength and Soundness

In critical thinking we do not just want to analyze the structure of arguments, we want to actually be able to make inferences. In order to be able to draw conclusions from sets of premises, i.e. to actually make inferences from sets of premises, we do need a logically strong argument, but we must also ensure that the premises are true. The same is true if we are to be convinced by an argument that is presented to us, we must determine that it is logically strong and that the premises are true. Thus, we see that for an argument to be convincing it must be both logically strong and have true premises, such arguments are called sound arguments.

It is important to emphasize that truth is a property of statements and never of arguments (you can never have a true argument) and that logical strength and soundness are properties of arguments and never of statements (you can never have a logically strong statement). Logical strength refers to the connection between the premises and the conclusion. Soundness is a
property of the argument as a whole. When assessing an argument one must always ask the two questions:

1. Is this argument logically strong?
2. Are the premises true?

Only when both of these questions have been answered can we reasonably accept the conclusion (on the basis of the premises stated—there may be other reasons to accept the conclusion). If the answer to both of these questions is yes, then the argument is sound.