Arguments and reasoning

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Introduction and learning outcomes

Argumentative texts are common across all college disciplines. Argumentative texts support propositions. For instance, texts you need to read for a course in science will most likely provide evidence to support theories; in social sciences, you will read about debates of the theoretical aspects of a variety of topics. Whatever you are studying, you will need to judge whether the text is an appropriate and reliable source of information. Some texts will be more factual than others, while others will attempt to influence your opinions.

By facilitating your learning about arguments, this unit will show you ways in which texts can influence your thinking. It will provide examples of deductive and inductive reasoning, and show you which arguments to accept as good (valid, sound, strong, cogent) and which to reject as bad (invalid, unsound, weak, uncogent).

At the end of this unit, you will have improved your skills in distinguishing good from bad arguments and in building convincing arguments that are informed by evidence.

Reflective activity

What is the first thing that comes to your mind when you hear the word 'argument'? Read the statement below and note down how you understand the meaning of the term 'argument' in this statement. Is the meaning obvious and clear-cut, or a bit obscure and ambiguous?

Anger is never without an argument, but seldom with a good one.

Indira Gandhi (1)

(Some sources attribute these words to the Indian stateswoman Indira Gandhi, for example www.thequotes.net and www.quotehd.com.)

Once you have made notes, compare your thoughts with the revealed text below.

Reveal Hide

You may remember that we discussed the meaning of the term ‘argument’ in the first module and asked you to do some research in online dictionaries. (I checked Collins Dictionary.) When reading the first part of the statement ‘Anger is never without an argument’, I thought it refers clearly to a conversation in

which people disagree with each other angrily or noisily (a quarrel), but reading the second part ‘but seldom with a good one’ the meaning wasn't so obvious any more. I thought a ‘good argument’ is more likely referring to another meaning of the word argument: ‘A statement or set of statements that you use in order to try to convince people that your opinion about something is correct’. I guess the author of the quote was intentionally playing with different meanings of the word argument. Many people may associate anger with a quarrel but when reading the whole sentence doubts will come up whether a quarrel is indeed what is meant.

Now go to the next page to find out more about the meaning of ‘argument’, commonly used in research and philosophy and which we will use in this course.

Note your thoughts down. Post your ideas in the discussion forum if you'd like to share them with your fellow students.

What does ‘argument’ mean?

In the online ‘Oxford Living Dictionaries’ (1), the first two meanings of the word 'argument' are:

1. An exchange of diverging or opposite views, typically a heated or angry one

E.g. Mike and Anthony had a nasty argument over who was to blame for the failure of the plan to rescue the dog.

In everyday life, you will quite often use this meaning when referring to ‘argument’. Synonyms include ‘quarrel’ or ‘fight’.

2. A reason or set of reasons given in support of an idea, action or theory

E.g. His argument in favour of going on with the publication of the journal convinced most members of the board.

This meaning of argument is the one we will follow in the course.

In an online lecture called 'Critical Reasoning for Beginners' (2), Marianne Talbot, professor of philosophy in the Department for Continuing Education at University of Oxford, defines an argument as a set of sentences of which one is said to be true, and the other(s) offer reasons for proof. In an argument, the *conclusion* follows from the *premise* or *set of premises*. In other words, one or more premises are offered as reasons for believing the conclusion. This use of the term ‘argument’ is common in logic and philosophy. Consider the following example:

It's 8.55am. It takes us at least 15 minutes to get to school. Class starts at 9.00am. So we will be late for class.

This is a four-sentence argument. The sentence ‘We will be late for class’ is said to be true, while the other three (It’s 8.55am. It takes us at least 15 minutes to get to school. Class starts at 9.00am.) are being offered as reasons for believing that.

The sentence said to be true is the *conclusion*, while the other sentences are the *premises* or *evidence*. In the above example, the conclusion is ‘We will be late for class’, while the other three sentences are the premises, or the evidence given in support of the conclusion. Another word for conclusion (in this sense) is *claim*.

Note that not all sets of sentences are arguments. For instance, ‘It’s 8.55am. Class starts at 9.00am. It takes us at least 15 minutes to get to school.’ is a set of three related sentences. However, this is not an argument, because the speaker is not claiming or concluding anything based on the three sentences.

Also note that one simple sentence cannot be an argument on its own. For instance, ‘We are going to be late for class’ on its own is not an argument, because the speaker is not providing any evidence for this, so this sentence is a simple statement or assertion.

How to spot an argument?

There are some words or expressions that indicate a premise, and others that indicate a conclusion.

Premise indicators (examples)	**Conclusion indicators (examples)**
since as (indicated by) because for given that assuming that owing to we may infer from	consequently so therefore thus hence accordingly for this reason that is why we may conclude/infer that it follows that as a result

Note that the above signal words do not always indicate an argument. For instance, 'because' sometimes simply introduces an explanation. Consider, for instance, the following sentence: **I arrived late because I had been shopping**. Here, the speaker is merely explaining why she arrived late, and not making any claim. However, in the following sentence, 'because' does indicate a premise: **She should win the award, because her work has always been outstanding, and she has worked hard to prepare her application despite being off sick for a long time**.

Also note that not all writers or speakers provide these signal words for their arguments. The reader or listener needs to establish whether the intention is to present an argument and, if so, which sentences are the evidence, and which the conclusion.

Q&A activity

For instance, consider this set of sentences:

If you go shopping, we will be late for the 9 o'clock show. It takes at least 5 minutes just to get to the shop, not to mention queuing at the check-out, and it's already 8.55.

This argument contains no indicators. Can you identify the conclusion and the premises in it anyway?

Reveal Hide

Premise 1: It takes at least 5 minutes just to get to the shop, not to mention queuing at the check-out.

Premise 2: It's already 8.55.

Conclusion: If you go shopping, we will be late for the 9 o'clock show.

Find the arguments in a text

Practical activity

Download this text about ‘Nepal’s indigenous medical knowledge’. Try to spot any premise and/or conclusion indicators and highlight them. Check whether the sentences with the indicators are arguments. Also check whether you can find any further arguments without indicators.

Now complete this table by adding the missing premises and/or conclusions of the arguments.

Once you have done that, reveal the sample table below and compare with your findings.

Reveal Hide

Deductive and inductive reasoning

An argument is either deductive or inductive; so the two basic types of arguments are deductive arguments and inductive arguments (see handout 'Argument terminology').

While deductive arguments are useful when you want to prove your point in a matter of logic or mathematical reasoning (such as when you write a proof), they are not so helpful in supporting humans to broaden their horizons. Inductive arguments, on the other hand, are very important in science because they help us come up with something new in our search for more regularities. They help us make predictions, generalization and educated guesses about the future based on our observation of past events, thus enriching our knowledge. While sound deductive arguments provide us with certainty, they do not help us enrich our knowledge. On the other hand, good inductive arguments, although merely indicating probability, help us broaden our horizons.

A **deductive argument** follows deductively from its premises. In other words, we base our argument on the inference of a particular case from a general law. These arguments are said to be *truth-preserving*, because the truth of the premise(s) guarantees the truth of the conclusion. Conversely, if at least one of the premises is not true, one cannot draw a conclusion any more.

Deductive arguments are said to be *logically valid* if the truth of the conclusion follows from the truth of the premises. This means if a deductive argument's premises are all true and nevertheless you find the conclusion is false, the argument must be invalid.

Deductive arguments are called 'sound' if all of their premises are true and 'unsound' if at least one of their premises is not true.

Consider the following logically valid and sound deductive argument:

Premise 1: Dr Mwanzu is always in her office on a Monday morning.

Premise 2: It is Monday morning.

Conclusion: Therefore, Dr Mwanzu is in her office.

Let's briefly analyse it: 'Dr Mwanzu is in her office' – the conclusion – is said to be true based on the premises that 1) 'It is Monday morning' and 2) 'Dr Mwanzu is always in her office on a Monday morning.' The general law is that 'Dr Mwanzu is always in her office on a Monday morning'. The particular case is this Monday morning – indicated by 'It is Monday morning'. So as long as we accept the truth of the premises, we will also accept the truth of the conclusion. However, we have not really learned anything new from the conclusion here. We merely concluded relative to a particular case inferring from the already accepted 'law'.

Q&A activity

Read the following example. Do you think the conclusion is true? Why or why not?

Premise 1: All egg-laying animals are birds.

Premise 2: All birds have feathers.

Conclusion: Therefore, all egg-laying animals have feathers.

Once you have thought this through for yourself, you can reveal the comment below.

Reveal Hide

You have most likely found out that the conclusion is false. For example, turtles or snakes are also egg-laying animals, and they do not have feathers. But what is the flaw in the argument? The argument is logically valid: If ‘all egg-laying animals are birds and all birds have feathers then we certainly can conclude that ‘all egg-laying animals have feathers’. But Premise 1 is of course wrong; not all egg-laying animals are birds as, for example, reptiles lay eggs too.

Now read this next argument.

Ask yourself again: Is the conclusion true? Why or why not?

Premise 1: All birds have feathers.

Premise 2: Bessie has feathers (as a trustworthy source confirms).

Conclusion: Therefore, Bessie is a bird.

Once you have thought this through you can open the comment below.

Reveal Hide

Bessie Smith (1)

As you can see from the picture, the Bessie in this case is of course not a bird. Apologies if we have fooled you a bit; the picture surely would have made the answer easier for you.

However, let’s analyse the argument: Both premises seem to be true this time. Feathers are one of the essential characteristics of birds; so all birds have feathers indeed. And the picture shows indeed that Bessie has feathers. But we should question the logic of the deduction here. The first premise was not that 'only birds have feathers'. Although birds are the only *animals* which ‘have’ feathers, persons can ‘have’, meaning possess, feathers too. So you need to know other details about Bessie before you can conclude that Bessie is a bird. Therefore, there is a flaw in the logic of the argument, meaning the argument

becomes logically invalid.

The following example demonstrates how one could word a valid and sound argument.
Of all animals, only birds have feathers; and since the crane is an animal with feathers, the crane is a bird.

Premise 1: Of all animals, only birds have feathers.(Premise 1 is a general law)

Premise 2: The crane is an animal with feathers.(Premise 2 describes the particular case)

Conclusion: Therefore, the crane is a bird.

Inductive arguments

An **inductive argument** follows inductively from its premises. In other words, we base our argument on the inference of a general law from particular instances. Inductive arguments are not truth-preserving. This means that in an inductive argument the premises can be true without the conclusion having to be true. The truth of the premises merely raises the probability of the truth of the conclusion.

Inductive arguments can be strong (high probability that the truth of the conclusion follows the truth of the premises) or weak (low probability that the truth of the conclusion follows the truth of the premises).

A strong inductive argument is called cogent (i.e. good, believable, probably true) when all the premises are true, and uncogent (bad, unbelievable) when not all the premises are true. Look at the handout on argument terminology to support your understanding.

Consider the following **inductive** argument:

Premise: Every morning in the history of mankind, the sun has risen.

Conclusion: Therefore, the sun will rise tomorrow morning.

This argument is believable or cogent, as the probability of the sun rising tomorrow morning is hard to doubt. However, we will have to wait until tomorrow to be absolutely sure of it. 'Tomorrow morning' is not part of 'the *history* of mankind'; it is its future.

Here is another example of inductive reasoning:

Consider an app which helps you navigate new territory in a city. It may be able to tell you in advance how long you will need to reach your destination based on numerous instances of observation fed into it, taking into account time of day and traffic conditions customary to that specific day at that specific time. The app won't guarantee your arrival as predicted, but nevertheless will prove to be a useful tool for you to plan your journey.

Let's assume this scenario: You are visiting Johannesburg and want to travel from Rosebank Mall to Nelson Mandela Square by train.

The reasoning of the app developers is inductive:

On a large number of observed and documented instances, it has taken people traveling in conditions very similar to yours (meaning by train) 25 minutes to make that specific journey from Rosebank Mall to Nelson Mandela Square. Therefore, it should take you this amount of time as well.

Note down the premise of the developers' inductive argument and the conclusion. Once done, check whether you have done it correctly by revealing the comment below.

Reveal Hide

Premise: *On a large number of observed and documented instances, it has taken people traveling in conditions very similar to yours (meaning by train) 25 minutes to make that specific journey.*

Conclusion: *Therefore, it should take you this amount of time as well.*

Q&A activity

Now consider the following argument:

Premise 1: Current evidence indicates that fruits and vegetables consumed as part of the daily diet can help reduce the risk of coronary heart disease, stroke and certain types of cancer [see for example, (1)].

Premise 2: Ovo-lacto vegetarians avoid the consumption of fruit and vegetables.

Conclusion: Therefore, based on the current evidence, the diet of ovo-lacto vegetarians cannot be seen as a healthy diet.

Do you think the conclusion of this argument is believable? Why or why not?

Tip: If you don't know what an ovo-lacto vegetarian diet is, look it up.

Once you have made up your mind, reveal the comment below.

Reveal Hide

Premise 1 is believable. There are quite a few research studies which indicate that fruits and vegetables can help reduce the risk of certain diseases. So a diet which avoids the consumption of fruit and vegetables wouldn't be considered as a healthy diet, based on the current evidence of research. However, premise 2 is wrong. Ovo-lacto vegetarians don't avoid the consumption of fruit and vegetables; they don't eat meat. Therefore, the conclusion cannot be deduced from the premises.

Now read this argument about the size of dinosaurs compared to animals living today:

Premise 1: The size of the Tyrannosaurus rex is described to be about 12 metres long.

Premise 2: Argentinosaurus is known from just a few bones, but its size has been estimated at 30 metres in length.

Premise 3: The Giraffatitan's size has been estimated between 21.8–22.5 metres in length and about 12 meters tall.

Premise 4: An African giraffe, the tallest land animal in the world, can grow to about six metres tall.

Conclusion: Therefore, most dinosaurs were likely to be huge compared to the land animals living today.

Do you think the conclusion of this argument is convincing? Why or why not?

After having thought through your answer, reveal the comment below.

Reveal Hide

Tyrannosaurus, Argentinosaurus and Giraffatitan are merely three of the several hundred of dinosaur genera discovered. This argument is weak because there is a very low probability that the truth of the conclusion follows the truth of the premises, as it is based on only 3 examples. Actually, dinosaurs show some of the most extreme variations in size of any land animal group.

Inductive arguments are very important in science because they help us say something new based on what we already know. They help us make predictions, generalization, educated guesses about the future based on our observation of past events, thus increasing our knowledge. While sound deductive arguments provide us with certainty, they do not help us enrich our knowledge. On the other hand, strong cogent inductive arguments, although merely indicating probability, help us broaden our horizons.

Is that believable?

Quiz

Read the following statements and answer the questions. Think critically and try to apply your learning from this self-study programme. To help you we have noted down the premises and conclusions for some arguments explicitly. If we haven't done it, try to do it yourself. And always try to state the reasons why you think a response option is correct or not.
Once you have selected an answer option, you can check whether your thinking was right. Just click the check button.

Don't worry if you don't get the answers right first time; we learn from our mistakes and you can repeat the quiz how often you like. Only a very experienced critical thinker wouldn't have difficulties with answering the questions, since they are quite tricky.

Question 1

Tortoises are reptiles with flippers instead of feet. One can conclude that it is likely they must live mainly in water.

Premise: Tortoises are reptiles with flippers instead of feet.

Conclusion: It is likely they must live mainly in water.

How would an experienced critical thinker rate this argument?

- ○ Good/cogent
- ○ Poor/uncogent

Check

Question 2

Theresa lives in Namibia. She says: "I won't see my mother again this year. But I will see her the day after tomorrow."

Premise 1: Theresa says she won't see her mother again this year.

Premise 2: Theresa says she will see her mother the day after tomorrow.

What can you conclude from these premises?

Select **all** the correct conclusions which can be deduced from the premises. Your

response will only be marked as correct if you have selected all correct and none of the incorrect answer options.

- [ ] Theresa must be telling a lie or is confused.
- [ ] If Theresa tells the truth, her mother must live far away.
- [ ] If Theresa tells the truth, it must be December.
- [ ] If Theresa tells the truth, she will see her mother on the 1st or 2nd of January.

Check

> **Learn more about the correct conclusions**

Question 3

There are three persons A, B and C. A is a brother of B. B is a brother of C. We think of brothers in the meaning of having the same parents. Karabo says then certainly C must be the brother of A.

Premise 1: A is a brother of B.

Premise 2: B is a brother of C.

Premise 3: Brothers have the same parents.

Conclusion: C must be the brother of A.

If we assume the premises are true, how would an experienced critical thinker rate Karabo's conclusion based on the given premises?

- ○ Good
- ○ Poor

Check

Question 4

The discovery of a new species of human relative was announced today (10 September 2015) by the University of the Witwatersrand, the National Geographic Society and the South African Department of Science and Technology/National Research Foundation (DST/NRF). This finding sheds light on the origins and diversity of our genus. The new species, homo naledi, appears to have intentionally deposited bodies of its dead in a remote cave

appears to have intentionally deposited bodies of its dead in a remote cave chamber, a behaviour previously thought to be limited to humans. (1)

How would an experienced critical thinker characterize this statement? Select the option which describes the statement best.

- It's no argument at all
- It's a poor argument which one should not believe
- It's a good believable argument

Check

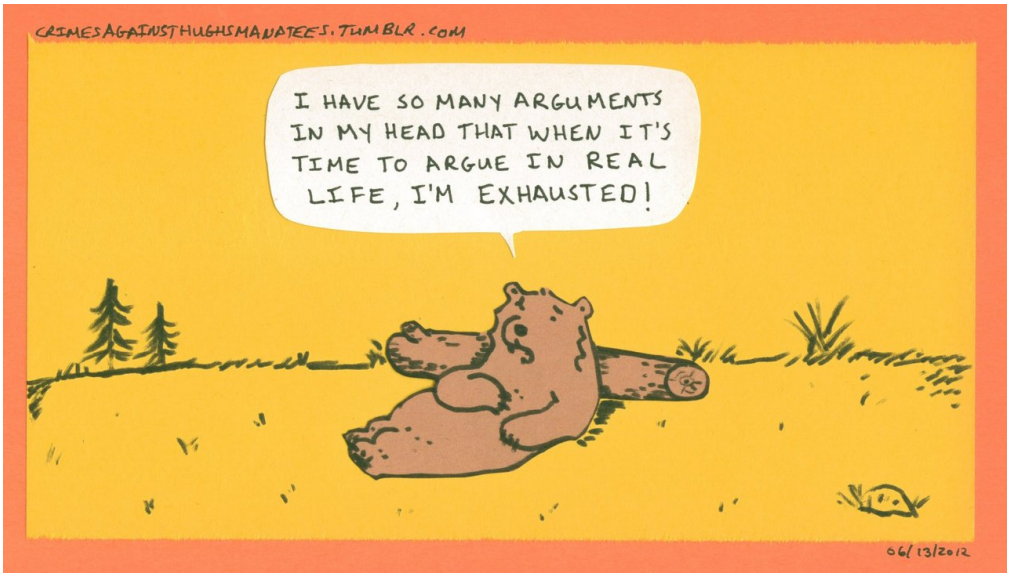
Question 5

Sylvia claims that sound research evidence, which proves that human activities are one major cause of global warming, does not sufficiently motivate people to change harmful behaviour.

Which of the following premises could support Sylvia's claim so that she can express a convincing argument? Select **all** supportive premises. Your response will only be marked as correct, if you have selected all correct and none of the incorrect answer options.

What have I learned?

Reflective activity



Cartoon from Crimes Against Hugh's Manatees by Hugh D. Crawford (1)

Reflect on your learning in this unit. Go over your notes from the first activity and then answer the questions below:

- How would you describe your learning experience?
- Did you find the tasks easy or difficult or just right? Which were more challenging?
- What are the three most important things you now know and which you did not know at the beginning of this unit?
- How do you expect your new learning to impact how you read or hear information in the future?

Prepare questions or issues that you would like to clarify or discuss with your friends or in class with your tutor.

Note your thoughts down. Post your ideas in the discussion forum if you'd like to share them with your fellow students.

References and further resources

References by course pages

Introduction and learning outcomes

1. Photo 'Indira Gandhi' from Defense Department, US government (DSD.LBL.gov), , retrieved 15 March 2018. This work is in the public domain in the United States because it is a work prepared by an officer or employee of the United States Government as part of that person's official duties under the terms of Title 17, Chapter 1, Section 105 of the US Code.This is a retouched picture, which means that it has been digitally altered from its original version.

What does 'argument' mean?

1. Oxford Living Dictionaries English, available at https://en.oxforddictionaries.com; https://en.oxforddictionaries.com/definition/argument
2. Talbot, M. (2010). 'The Nature of Arguments', https://podcasts.ox.ac.uk/nature-arguments, accessed 15 March 2018.

Find the arguments in a text!

1. INASP (2017). 'Nepal's rich indigenous medical knowledge is under threat' http://www.inasp.info/en/news/details/241/ (accessed 5 May 2017). INASP news based on: Poudel, M. and Singh, N.B.. 'Medical Ethno-biology and Indigenous Knowledge System Found in Darai Ethnic Group of Chitwan, Nepal' , Volume 21, Issue 1, August 2016, page: 103-111 of the Journal of Institute of Science and Technology. It is available online on the NepJOL platform, which is supported by INASP and maintained by TUCL.

Deductive and inductive reasoning

1. Photo 'Bessie Smith' (1936) by Carl Van Vechten, https://en.wikipedia.org/wiki/File:Bessie_Smith_(1936)_by_Carl_Van_Vechten.jpg, retrieved 15 March 2018. For further copyright details, see the website.

Inductive arguments

1. WHO Technical staff (2014). 'Increasing fruit and vegetable consumption to reduce the risk of noncommunicable diseases', September 2014. http://www.who.int/elena/titles/bbc/fruit_vegetables_ncds/en/ (accessed 05 May 2017)

Is that believable?

1. 'New Species of Human Relative Discovered in South African Cave'. National Geographic, 10 September 2015, http://press.nationalgeographic.com/2015/09/10/homo_naledi/ (accessed 5 May 2017)

What have I learned?

1. Comic from Crimes Against Hugh's Manatees by Hugh D. Crawford, http://crimesagainsthughsmanatees.tumblr.com/image/25065291735, licensed under CC BY-NC-ND 3.0, retrieved 16 March 2018

Further resources

Farcaster (2016). PowerPoint slide based on argument terminology, licensed under CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=46732080

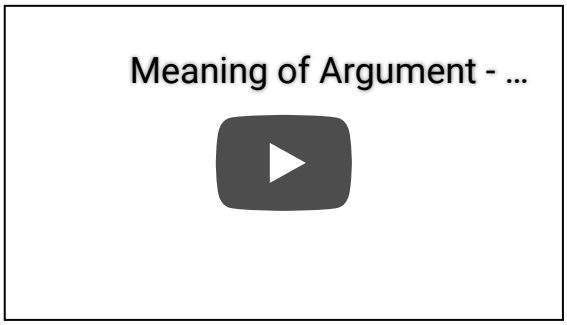
Halpern, D. (2003). 'Thought and Knowledge: An Introduction to Critical Thinking', Fourth Edition, Lawrence Erlbaum Associates, Publishers, New Jersey.

Talbot, M. (2012). 'Bioethics: an Introduction', podcast, available at http://podcasts.ox.ac.uk/induction (accessed 22 January 2018)

The Open University. 'How to be a critical reader', available at http://www.open.edu/openlearn/languages/english-language/how-be-critical-reader/content-section-0?LKCAMPAIGN=ebook_MEDIA=ol (accessed 22 January 2018)

Videos

English Course Tube (2017). Video 'Meanings of the term argument': https://www.youtube.com/watch?v=kj40UoCTxig (accessed 26/01/2018).



deLaplante, K. (2013). Video 'What is an argument' (accessed 26/01/2018).