1.4 Validity and soundness

In his book *The Unnatural Nature of Science* the eminent British biologist Lewis Wolpert (b. 1929) argued that the one thing that unites almost all of the sciences is that they often fly in the face of common sense. Philosophy, however, may exceed even the sciences on this point. Its theories, conclusions and terms can at times be extraordinarily counter-intuitive and contrary to ordinary ways of thinking, doing and speaking.

Take, for example, the word 'valid'. In everyday speech, people talk about someone 'making a valid point' or 'having a valid opinion'. In philosophical speech, however, the word 'valid' is reserved exclusively for arguments. More surprisingly, a valid argument can look like this:

1. All blocks of cheese are more intelligent than any philosophy student.
2. Meg the cat is a block of cheese.
3. Therefore Meg the cat is more intelligent than any philosophy student.

All utter nonsense, you may think, but from a strictly logical point of view it is a perfect example of a valid argument. What's going on?

Defining validity

Validity is a property of well-formed deductive arguments, which, to recap, are defined as arguments where the conclusion in some sense (actually, hypothetically, etc.) follows from the premises *necessarily* (see 1.2). Calling a deductive argument 'valid' affirms that the conclusion actually does follow from the premises in that way. Arguments that are presented as or taken to be successful deductive arguments but where the conclusion does not in fact definitely follow from the premises are called 'invalid' deductive arguments.

The tricky thing, in any case, is that an argument may possess the property of validity even if its premises or its conclusion are *not* in fact *true*. Validity, as it turns out, is essentially a property of an argument's *structure*. And so, with regard to validity, the *content* or truth of the statements composing the argument is irrelevant. Let's unpack this.

Consider structure first. The argument featuring cats and cheese given above is an instance of a more general argumentative structure, of the form:

1. All Xs are Ys.
2. Z is an X.
3. Therefore Z is a Y.

In our example, 'block of cheese' is substituted for X, 'things that are more intelligent than all philosophy students' for Y, and 'Meg' for Z. That makes our example just one particular instance of the more general argumentative form expressed with the variables X, Y and Z.

What you should notice is that you don't need to attach any meaning to the variables to see that this particular structure is a valid one. No matter what we replace the variables with, it will always be the case that *if* the premises are true (although in fact they might not be), the conclusion *must* also be true. If there's *any* conceivable way possible for the premises of an argument to be true but its conclusion simultaneously be false, then it is an invalid argument.

What this boils down to is that the notion of validity is content-blind (or 'topic-neutral'). It really doesn't matter what the content of the propositions in the argument is – validity is determined by the argument having a solid, deductive structure. Our example is then a valid argument because *if* its ridiculous premises were true, the ridiculous conclusion would also have to be true. The fact that the premises are ridiculous is neither here nor there when it comes to assessing the argument's validity.

The truth machine

From another point of view we might consider that arguments work a bit like sausage machines. You put ingredients (premises) in, and then you get something (conclusions) out. Deductive arguments may be thought of as the best kind of sausage machine because they *guarantee* their output in the sense that when you put in good ingredients (all true premises), you get out a quality product (true conclusions). Of course if you don't start with good ingredients, deductive arguments don't guarantee a good end product.

Invalid arguments are not generally desirable machines to employ. They provide no guarantee whatsoever for the quality of the end product. You

might put in good ingredients (true premises) and sometimes get a high-quality result (a true conclusion). Other times good ingredients might yield a poor result (a false conclusion).

Stranger still (and very different from sausage machines), with invalid deductive arguments you might sometimes put in poor ingredients (one or more false premises) but actually end up with a good result (a true conclusion). Of course, in other cases with invalid machines you put in poor ingredients and end up with rubbish. The thing about invalid machines is that you don't know what you'll get out. With valid machines, when you put in good ingredients (though *only* when you put in good ingredients), you have assurance. In sum:

Invalid argument
Put in false premise(s) → get out either a true or false conclusion
Put in true premise(s) → get out either a true or false conclusion

Valid argument
Put in false premise(s) → get out either a true or false conclusion
Put in true premise(s) → get out only a true conclusion

Soundness

To say an argument is valid, then, is not to say that its conclusion must be accepted as true. The conclusion is established as true *only if* (1) the argument is valid *and* (2) the premises are true. This combination of valid argument plus true premises (and therefore a true conclusion) is called approvingly a 'sound' argument. Calling it sound is the highest endorsement one can give for an argument. If you accept an argument as sound, you are really saying that one must accept its conclusion. This can be shown by the use of another especially instructive valid, deductive argument:

1. If the premises of the argument are true, then the conclusion must also be true. (That is to say, you're maintaining that the argument is valid.)
2. The premises of the argument are true.

If you regard these two as premises, you can advance a deductive argument that itself concludes with certainty:

3. Therefore, the conclusion of the argument must also be true.

For a deductive argument to pass muster, it must be valid. But being valid is not sufficient to make it a sound argument. A sound argument must not only be valid; it must have true premises, as well. It is, strictly speaking, only sound arguments whose conclusions we *must* accept.

Importance of validity

This may lead you to wonder why, then, the concept of validity has any importance. After all, valid arguments can be absurd in their content and false in their conclusions – as in our cheese and cats example. Surely it is soundness that matters.

Keep in mind, however, that validity is a required component of soundness, so there can be no sound arguments without valid ones. Working out whether or not the claims you make in your premises are true, while important, is simply not enough to ensure that you draw true conclusions. People make this mistake all the time. They forget that you can begin with a set of entirely true beliefs but reason so poorly as to end up with entirely false conclusions. The problem is that starting with truth doesn't guarantee ending up with it.

Furthermore in launching criticism, it is important to grasp that understanding validity gives you an additional tool for evaluating another's position. In criticizing a specimen of reasoning you can either

1. attack the truth of the premises from which he or she reasons,
2. or show that his or her argument is invalid, regardless of whether or not the premises deployed are true.

Validity is, simply put, a crucial ingredient in arguing, criticizing and thinking well, even if not the only ingredient. It is an indispensable philosophical tool. Master it.

SEE ALSO

1.1 Arguments, premises and conclusions
1.2 Deduction
1.5 Invalidity

READING

Aristotle (384–322 BCE), *Prior Analytics*
Fred R. Berger, *Studying Deductive Logic* (1977)
★ Patrick J. Hurley, *A Concise Introduction to Logic*, 10th edn (2007)

1.5 Invalidity

Given the definition of a valid argument, it may seem obvious what an invalid one looks like. Certainly, it is simple enough to define an invalid argument: it is one where the truth of the premises does not guarantee the truth of the conclusion. To put it another way, if the premises of an invalid argument are true, the conclusion may still be false. Invalid arguments are unsuccessful deductions and therefore, in a sense, are not truly deductions at all.

To be armed with an accurate definition of invalidity, however, may not be enough to enable you to make use of this tool. The man who went looking for a horse equipped only with the definition 'solid-hoofed, herbivorous, domesticated mammal used for draught work and riding' (*Collins English Dictionary*) discovered as much, to his cost. In addition to the definition, you need to understand the definition's full import. Consider this argument:

1. Vegetarians do not eat pork sausages.
2. Gandhi did not eat pork sausages.
3. Therefore Gandhi was a vegetarian.

If you're thinking carefully, you'll have probably noticed that this is an invalid argument. But it wouldn't be surprising if you and a fair number of readers required a double take to see that it is in fact invalid. And if one can easily miss a clear case of invalidity in the midst of an article devoted to a careful explanation of the concept, imagine how easy it is not to spot invalid arguments more generally.

One reason why some fail to notice that this argument is invalid is because all three propositions are true. If nothing false is asserted in the premises of an argument and the conclusion is true, it's easy to think that the argument is therefore valid (and sound). But remember that an argument is valid *only*

if the truth of the premises *guarantees* the truth of the conclusion in the sense that the conclusion is never false when the premises are true. In this example, this isn't so. After all, a person may not eat pork sausages yet not be a vegetarian. He or she may, for example, be an otherwise carnivorous Muslim or Jew. He or she simply may not like pork sausages but frequently enjoy turkey or beef.

So, the fact that Gandhi did not eat pork sausages does *not*, in conjunction with the first premise, guarantee that he was a vegetarian. It just so happens that he was. But, of course, since an argument can only be sound if it is valid, the fact that all three of the propositions it asserts are true does *not* make it a sound argument.

Remember that validity is a property of an argument's structure. In this case, the structure is

1. All Xs are Ys.
2. Z is a Y.
3. Therefore Z is an X.

where X is substituted for 'vegetarian', Y for 'person who does not eat pork sausages' and Z for 'Gandhi'. We can see why this structure is invalid by replacing these variables with other terms that produce true premises, but a clearly false conclusion. (Replacing terms creates a new '*substitution instance*' of the argument form.) If we substitute X for 'Cat', Y for 'meat eater' and Z for 'the president of the United States', we get:

1. All cats are meat eaters.
2. The president of the United States is a meat eater.
3. Therefore the president of the United States is a cat.

The premises are true but the conclusion clearly false. Therefore this cannot be a valid argument structure. (You can do this with various invalid argument forms. Showing that an argument form is invalid by substituting sentences into that form in a way that results in true premises but a false conclusion is called showing invalidity by 'counterexample'. See 3.8.)

It should be clear therefore that, as with validity, invalidity is not determined by the truth or falsehood of the premises but by the logical relations among them. This reflects a wider, important feature of philosophy. Philosophy is not just about saying things that are true; it is about making true claims that are grounded in good arguments. You may have a particular

viewpoint on a philosophical issue, and it may just turn out by sheer luck that you are right. But, in many cases, unless you can show you are right by the use of good arguments, your viewpoint is not going to carry any weight in philosophy. Philosophers are not just concerned with the truth, but with what makes it the truth and how we can show that it is the truth.

SEE ALSO

1.2 Deduction
1.4 Validity and soundness
1.7 Fallacies

READING

★ Irving M. Copi, *Introduction to Logic*, 10th edn (1998)
★ Harry Gensler, *Introduction to Logic* (2001)
★ Patrick J. Hurley, *A Concise Introduction to Logic*, 10th edn (2008)

1.6 Consistency

Ralph Waldo Emerson may have written that 'a foolish consistency is the hobgoblin of little minds', but of all the philosophical crimes there are, the one you really don't want to get charged with is inconsistency. Consistency is the cornerstone of rationality. What then, exactly, does consistency mean?

'Consistency' is a property characterizing two or more statements. If you hold two or more inconsistent beliefs, then, at root, this means you face a logically insurmountable problem with their truth. More precisely, the statements of your beliefs will be found to be somehow either to 'contradict' one another or to be 'contrary' to one another, or together imply contradiction or contrariety. Statements are 'contradictory' when they are opposite in 'truth value': when one is true the other is false, and vice versa. Statements are 'contrary' when they can't both be true but, unlike contradictories, can both be false. (A single sentence can be 'self-contradictory' when it makes an assertion that is necessarily false – often by conjoining two inconsistent sentences).