

# Teaching Sound Principles about Invalidity

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**Abstract.** One of the aims of introductory logic courses for humanities students is to help them understand the structure of, and the evaluation criteria for, natural language arguments. In order to show that symbolic logic can help students achieve this understanding the relationship between natural language arguments and formal language arguments has to be clearly, and correctly, elucidated. The notions of logical form and formal (in)validity, and their relation with the (in)validity of natural language arguments, are essential for this elucidation. The purpose of this paper is to show and explain the fact that, notwithstanding James W. Oliver and Gerald Massey’s warnings concerning invalidity verdicts, wrong conceptions about logic-based methods for determining invalidity of natural language arguments have a residual existence in some present-day introductory logic textbooks.

**Keywords:** deductive invalidity, natural language arguments, logical form, logic-based methods for argument evaluation.

## 1 Introduction: The Asymmetry between Validity and Invalidity

In an until quite recently largely ignored paper James W. Oliver [7] denounced the fact that most introductory logic textbooks of the time assumed, explicitly or implicitly, the following false principle about deductive invalidity:

(1) An argument is invalid if and only if it is an instance of an invalid form.  
or the weaker conditional:

(2) An argument is invalid if it is an instance of an invalid form.

Oliver conjectured that the authors of those textbooks must wrongly have assumed that (1) could be deductively obtained by replacing “valid” by “invalid” in the following true principle:

(3) An argument is valid if and only if it is an instance of a valid form.

Those authors must have assumed that (1) could be deduced from (3) applying the inference scheme “ $\varphi$  if and only if  $\psi$ . Therefore, not  $\varphi$  if and only if not  $\psi$ ”. In fact, what actually follows from (3) is:

(4) An argument is invalid if and only if it is an instance of no valid form.

Oliver's objections were further developed and popularized by Gerald Massey [5][6] who concluded that there exists a radical asymmetry between validity and invalidity: logic is able to provide methods for demonstrating that particular natural language arguments are valid, but there are no logic-based methods for proving invalidity. While the formal validity of a particular natural language argument follows from the existence of at least one valid form of which it is an instance in some logical system, showing that it is not formally valid requires establishing that there is no valid form in any logical system of which it is an instance. Therefore, logic cannot provide conclusive arguments that bad natural language arguments are bad, and invalidity verdicts rest on intuitive judgments altogether unsupported by logical theory. Given that fallacies are a species of invalid arguments, one of the consequences of Massey's draws from his conclusion is that no logic-based theory of formal fallacies is possible.

As a result of the popularization of Massey's asymmetry thesis, most present-day introductory logic textbooks for humanities students include some cautionary remarks against the risk of jumping to conclusions when making verdicts on the invalidity of particular natural language arguments: on one level of analysis, an argument might well be shown to be an instance of an invalid form but if we are not careful enough we may overlook the fact that it is also an instance of a more complex valid form [9], p.21].

The purpose of this paper is to show and explain the fact that, notwithstanding this awareness about the problems concerning invalidity verdicts, wrong conceptions about invalidity have a residual existence in some present-day introductory logic textbooks.

## 2 Invalidity and Logical Form

Oliver conjectures that a probable source of wrong conceptions about invalidity lies in the character of the relationship between natural language arguments and the forms which these arguments have or of which they are instances: "[it is] a natural mode of expression to speak of 'the form' of an argument, and this way of speaking seems to lead to the view that, for any argument, there is a unique form" [7], p. 465]. In fact, if the uniqueness of logical form of the natural language arguments is assumed then a variation of principle (1) about invalidity follows. This derivation can be found in Dennis Packard and James Faulconer's introductory logic textbook [8], pp. 8-16] and proceeds thus:

(5) An argument is valid if and only if there is no argument of its form (called a counterexample) that has true assumptions and a false conclusion.

(5) (co)entails (6):

(6) An argument is invalid if and only if there is an argument of its form (called a counterexample) that has true assumptions and a false conclusion.

This derivation, unlike that presented in the Introduction, is a valid one. But, (5) is false if uniqueness of logical form for natural language arguments is not assumed. For, if the fact that an argument can be an instance of more than one argument form is accepted, and (5) is accordingly reformulated as:

(7) An argument is valid if and only if there is no argument of any of its forms that has true assumptions and a false conclusion.

then the following argument can be used to show that (7) is false:

(8) If something has been created by God, then everything has been created by God. Everything has been created by God. Therefore, something has been created by God.

(8) is an instance of the invalid form:

(9)  $(\varphi \rightarrow \psi), \psi / \varphi$

which has counterexamples like:

(10) If Philadelphia is the capital of Pennsylvania, then Pittsburgh is not. Pittsburgh is not the capital of Pennsylvania. Therefore, Philadelphia is the capital of Pennsylvania.

But, (8) is nonetheless a valid argument because it is also an instance of the valid form:

(11)  $(\exists x Cx \rightarrow \forall x Cx), \forall x Cx / \exists x Cx$

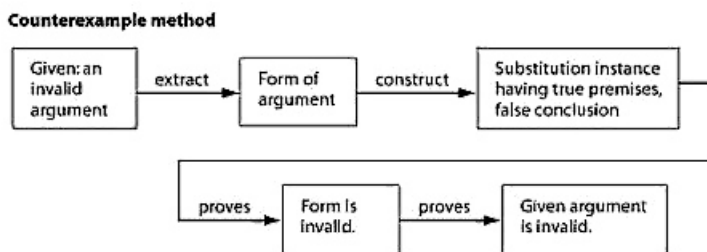
As Oliver observes, the question of whether arguments have or instantiate a unique logical form or many argument forms is a normative one. Nevertheless, the theoretical and practical consequences of adopting the uniqueness notion strongly recommend the adoption of the opposite position. And, in any case, we do not have any generally accepted criteria, and no working methods, by which to determine *the* logical form of a natural language argument.

### 3 Persisting in Error: A Case Study

In order to show how wrong conceptions about invalidity have a residual existence in present-day introductory logic textbooks I will examine Patrick Hurley's presentation of the counterexample method in his popular manual *A Concise Introduction to Logic* [4]. Hurley acknowledges that there are falsifying instances of principle (2), but immediately minimizes the importance of such cases:

The fact that some substitution instances of invalid forms are also substitution instances of valid forms means simply that we must exercise caution in identifying the form of an argument. However, cases of ordinary language arguments that can be interpreted as substitution instances of both valid and invalid forms are so rare that this book chooses to ignore them. [[4],pp.56-57]

To reinforce the idea that ordinary language arguments which are substitution instances of both valid and invalid forms are extremely rare he provides the following dubious example:



**Fig. 1.** The counterexample method as schematized in [4] , p.59

(12) All bachelors are persons. All unmarried men are persons. Therefore, all bachelors are unmarried men.

(12) is a substitution instance of the invalid form:

(13) All  $A$  are  $B$ . All  $C$  are  $B$ . Therefore, all  $A$  are  $C$ .

But, because "bachelors" is equivalent in meaning to "unmarried men," Hurley asserts that (12) is also a substitution instance of the valid form:

(14) All  $A$  are  $B$ . All  $A$  are  $B$ . Therefore, all  $A$  are  $A$ .

Of course, given that strictly speaking (12) is not a substitution instance of the form depicted by (14), this contrived example can only reaffirm students' belief that cases of natural language arguments that are instances of both valid and the invalid forms are difficult to find, if existent at all.

Figure 1 depicts the diagram that appears in [4] which further reinforces the notion that the counterexample method provides conclusive verdicts —proofs— of invalidity and that, after all, with negligible exceptions, an argument is invalid if it is an instance of an invalid form.

The diagram also reinforces the associated idea that a natural language argument has a unique form, a notion which as seen in the previous section allows the entailment of a variant of the rejected principle about invalidity. If the multiple argument form position is adopted, the fact that two arguments share one of their forms is not enough to conclude that they are both invalid, should one of them have true premises and false conclusion. But, as pointed out by Bencivenga [2] and Finocchiaro [3], the method of counterexample, like other procedures used to determine invalidity, is a non-deductive technique in which pragmatic considerations play an important role.

## 4 Conclusions

Typically, one of the aims of introductory logic courses for humanities students is to help them understand the structure of, and the evaluation criteria for, natural language arguments of disciplines such as philosophy[1]. In order to show that symbolic logic can help students achieve this understanding the relationship between natural language arguments and formal language arguments has to be clearly, and correctly, elucidated. The notions of logical form and formal validity

are essential for this elucidation but, as we have seen, wrong conceptions about these notions have a residual existence in some present-day introductory logic textbooks. In spite of what is asserted in these textbooks, symbolic logic cannot provide conclusive arguments to support verdicts of invalidity of natural language arguments.

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