

reply

Reasoning With Both Informal and Formal Logic

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The Challenge Accepted

It is not possible to teach both informal and formal logic and to be theoretically consistent. This is the content of the challenge given in Seale Doss's paper "Three Steps Towards a Theory of Informal Logic."¹ The challenge arises from Doss's two theses, the first of which is that "the theory of formal logic is quite simply and quite fundamentally *wrong*."² and the second is that there is a need to develop a "legitimate theory of reasoning"³, presumably because the present theories are all wrong.

In this paper I wish to take up the challenge and to argue that the first of Doss's theses is mistaken, and that the second has not been adequately argued for. So, Doss has failed to make out the case that it is not possible to teach both informal and formal logic and to be theoretically consistent.

Formal Logic and Formalization

Doss talks about "the theory of formal logic" in such a way that it seems clear that Doss is assuming that the formal logicians are advocating the view that a system of formal logic, such as classical Propositional Logic (PL), is itself a theory of reasoning, or at least embodies a theory of reasoning. Doss says,

I take it that the theory of formal logic is simply that correct reasoning is in accordance with a demonstrably valid inference pattern—for example, a pattern such as $((P \ \& \ (P \rightarrow Q)) \rightarrow Q)$.⁴

The first thing to be noted, and contested, is Doss's assertion that the formal logicians are maintaining that the relationship between formal logic and argumentation is based on

the simple notion that

- (1) All correct reasoning is in accordance with demonstrably valid inference patterns.

Now, (1) is not by any means the same as the assertion that

- (2) All reasoning which is in accordance with demonstrably valid inference patterns is correct.

Doss's description in (1) is misleading. I doubt if many formal logicians would hold to such a narrow view, and even if some did, it is certainly not my view. On the other hand, most formal logicians would want to argue that (2) is correct. I doubt that Doss would wish to deny (2) and assert that it's not true that arguments which have valid inference patterns are valid. Perhaps Doss just wants to assert that there are correct patterns of argumentation which cannot be represented in formal logics. I agree. But, as I argue below, this does not tell us that formal logic is all *wrong*.

Logical Relations Between Languages

Doss makes much of the fact that the material conditional of PL does not match the "If... then..." of English. This is not news. What is news is that someone should think that this means that *all* formal logic is thereby *wrong*. But perhaps this blanket condemnation is not Doss's point. Perhaps Doss means only to condemn PL. But, even that is too much. PL is no more or less than an artificial language with a defined semantics (truth tables) and proof theory (natural deduction).

It is not a theory of reasoning. It is just a precise language. The claim that it is wrong *because* it is a theory relies on the second assumption which lies behind Doss's first thesis.

The second assumption, which must be contested, is in Doss's portrayal of all formal logicians as holding the view that a formal or artificial language is a device which may be used to *abbreviate*, in some simple way, argument patterns in a natural language such as English. The best way of contesting Doss's second assumption, which is actually a theory about the relationship between languages, is to provide an alternative.

The sort of picture which Doss has of the relationship between formal and natural languages can be called the *formalization* view. It is true that some formal logicians hold to this view. But it is by no means the only possibility. I have argued that it is a profoundly misleading view⁵, and that one does not *formalize* or *abbreviate* English with PL, one *translates* English into PL. Having translated, it is important to understand the logical relationship between the translated sentence and its translation. Phillip Staines⁶ sets out a systematic account of the logical relations which hold between sentences of formal languages and those of natural languages. I wish to espouse this account. In what follows I will use PL and English as an example, since these are used by Staines and Doss.

The account begins with the dual assumption that in an applied PL the basic propositions are the same in both PL and English, by virtue of a definitional dictionary, and that a fairly straightforward account can be given of the logical relations which hold between the simplest cases involved in translation. The simplest cases are those where there are the smallest number of basic propositions with the propositional operators.

On Staines's view there are basic equivalences and implication relations. These can be arrived at by a variety of methods. For example, to take some not too controversial examples, consider the joint truth-table for the English *Either p or q*, where it is not specified whether this disjunction is inclusive or exclusive, and the PL $(p \vee q)$.

p	q	<i>Either p or q</i>	$p \vee q$
T	T	?	T
T	F	T	T
F	T	T	T
F	F	F	F

The question mark registers the fact that we don't know whether the disjunction is inclusive or exclusive. But, no matter what the ? is, it is clear that *Either p or q* implies $(p \vee q)$. This can be represented as:

$$\textit{Either } p \textit{ or } q \rightarrow (p \vee q)$$

where \rightarrow means *implies*,
and \leftrightarrow means *is equivalent to*

These implication arrows will be called "Staines' arrows".

It is clear that, unless we hold that *Either... or...* is always inclusive in English, we do not have the equivalence:

$$\textit{Either } p \textit{ or } q \leftrightarrow (p \vee q)$$

By the same method of joint truth tables we can see that:

$$\textit{Either } p \textit{ or } q \leftarrow (p \neq q)$$

We can then set out some equivalences and implications as follows: ["=" is being used as the sign for the material biconditional, " \neq " as the negation of the material biconditional, and "xor" abbreviates "exclusive or".—Ed.]

<i>not p</i>	\leftrightarrow	$\neg p$
<i>p and q</i>	\leftrightarrow	$(p \& q)$
<i>p or q</i>	\rightarrow	$(p \vee q)$
<i>p and/or q</i>	\leftrightarrow	$(p \vee q)$
<i>p or q</i>	\leftarrow	$(p \neq q)$
<i>p xor q</i>	\leftrightarrow	$(p \neq q)$
<i>if p then q</i>	\rightarrow	$(p \rightarrow q)$

By the substitutivity of equivalents and contraposition (if they are accepted) it can be argued that the following are also correct:

$$\begin{aligned} \textit{not if } p \textit{ then } q &\leftarrow \sim(p \rightarrow q) \\ \textit{neither } p \textit{ nor } q &\leftrightarrow \sim(p \vee q) \end{aligned}$$

There are some other interesting implications:

$$\textit{p and then } q \rightarrow (p \& q)$$

p is incompatible with $q \rightarrow \sim(p \ \& \ q)$
 necessarily $p \rightarrow p$
 possibly $p \leftarrow p$

Staines' account helps to make clear the nature of the problems which arise from translating "If p then q " as $(p \rightarrow q)$, and "It's not the case that if p then q " as $\sim(p \rightarrow q)$. The sentences are not equivalent to their translations. A search of PL soon shows that there is no sentence of the form $(p * q)$ (where $*$ is any of the sixteen dyadic operators) which is equivalent to "If p then q ". Similarly, there is no sentence of the form $\sim(p * q)$ which is equivalent to "It's not the case that if p then q ". There is no remedy in classical logic for this lack of equivalence.

But that is not the end of the story. These implications and equivalences can be put to work in deciding when a formal system like PL is an adequate instrument for the assessing of deductive arguments in English. If PL is to be of any use for the assessment of validity, then we need the following minimal conditons:

- a) The premises of the English argument must at least imply their PL translations. If they are equivalent to their PL translations, then they do imply them.
- b) The conclusion of the English argument must be implied by its PL translation. If they are equivalent, then the PL translation does imply the English.
- c) The PL argument must have a valid form.

If these conditions are satisfied then we have the following picture:

English		PL
P_1	\rightarrow	p_1
P_2	\rightarrow	p_2
P_n	\rightarrow	p_n
C	\leftarrow	c

Valid PL form.

In this case, the validity of the PL form is adequate to establish the validity of the English argument. By transitivity of implication, if the English premises were to be true, so would its conclusion be true.

It does not follow from the adequacy of a PL translation to test for validity that that

translation will be adequate for an invalidity test. The minimal conditions for the use of PL for invalidity are the converse of those for validity. They can be represented by the following picture:

English		PL
P_1	\leftarrow	p_1
P_2	\leftarrow	p_2
P_n	\leftarrow	p_n
C	\rightarrow	c

Invalid PL form.

In this case, the counter-example to the PL form will show that there is a counter-example to the English argument. The falsehood of the PL conclusion will show the English conclusion to be false, and the truth of the PL premises will show the English premises to be true.

We can apply these tests to one of Doss's pet hates:

$not \ P$	\leftrightarrow	$\sim p$
$If \ P \ then \ Q$	\rightarrow	$(p \rightarrow q)$

PL Valid.

Although the PL translation argument is valid, that does not in any way guarantee the validity of the English original. It is important to note also that PL cannot demonstrate the Invalidity of the English argument. This does not mean that it is neither Valid nor Invalid. Since it certainly looks invalid, perhaps a counter-example might be found, maybe even in English.

Under this approach to the use of PL for argument analysis, PL is not strictly adequate to assess the validity of any English argument with a conditional conclusion, nor the validity of any English argument with conditional premises. We might argue, *within a general theory*, about the weakening of these strict conditions.

From this account we can see that PL, or any formal language, is not a *theory* of reasoning, contra Doss. Throughout Doss's paper, logical systems, whether formal or informal, are treated as if they were *theories* of reasoning. But this is to place the *theory* of reasoning at the wrong level. The *theory* of reasoning should be at some meta-level

above any formal or informal logic. The *theory* will permit or prevent the use of any system to assess the correctness of reasoning. A *theory* of proof could make use of a *formal logic* of proof, a *theory* of questions and their answers could make use of a *formal logic* of questions and their answers. The bases for so permitting or preventing will be substantial parts of the *theory*. None of this is incompatible with the assumption that there is good argumentation in natural languages for which there is no adequate test of correctness in any present formal language.

Formal and Informal

We now turn to Doss's call for the development of a legitimate theory of reasoning. Doss writes:

In place of theory of *formal* logic, in place of the theory that correct reasoning is a function of demonstrably valid inference patterns, an alternative theory — that is, a theory of *informal* logic — would be simply this: correct reasoning is a function of the subject matter about which one is reasoning.⁷

and also

the search for universal *forms* is both misleading and futile.⁸

Much of this has already been dealt with. But there is one more thing. In this call for a legitimate theory of reasoning, Doss draws a distinction between formal and informal logic. Doss's picture is of two categories, on one side we have formal/universal, on the other we have informal/subject-specific. There are two problems with this distinction. It is simplistic and not consistent.

The informal/formal logic distinction involves at *least* two dimensions. There is one dimension which involves a distinction between those systems which involve some objective decision procedure and those which involve a set of subjective judgements, and another dimension which involves a distinction between those which involve some artificial symbolic language and those which do not. There are multiple distinctions which

divide the help tools for argument analysis into various categories. It is sometimes difficult to decide whether such systems of tools are properly to be labelled as 'informal' or 'formal'.

Doss's contrast between formal logic and informal logic, even if it were not oversimplified, has internal difficulties. Doss claims that formal logic is tied to a general approach, informal logic reflects a subject specific approach. But consider reasoning in mathematics. Even if we concede that reasoning should be understood in a subject specific way, reasoning in mathematics will have to account for proof and formality. Formal logic may well be the best tool for this subject. There may well be a distinction between the subject specific approach to reasoning and the general approach, but it is not the same distinction as normally holds between formal and informal logic.

Notes

- ¹ This Journal, Vol. vii, Nos. 2 & 3, Spring and Fall 1985.
- ² *ibid.* p. 129.
- ³ *ibid.* p. 132.
- ⁴ *ibid.* p. 128.
- ⁵ R. A. Girle, "Symbolization and Analogy", *Australian Logic Teachers' Journal*, Vol. 2, No. 2, 1978.
- ⁶ Phillip Staines, "Some Formal Aspects of the Argument-Symbolization Relation", *Australian Logic Teachers' Journal*, Vol. 5, No. 3, August 1981. (This material is set out in 'teaching form' in T. A. Halpin and R. A. Girle, *Deductive Logic* (2nd Ed.) Chapter 7, Strathpine: Logipress, 1981).
- ⁷ *Op. cit.* p. 132.
- ⁸ *Op. cit.* p. 133.

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