A CRITIQUE OF INDUCTIVE ARGUMENTS IN LOGIC

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Abstract

Blending the qualitative and analytic research methods, this article critically examines the nature and limitations of inductive arguments within the field of logic. Inductive arguments, unlike their deductive counterparts, provide conclusions that extend beyond the premises, thus offering probabilistic rather than certain conclusions. This critique emphasises the weak inferential connections inherent in inductive reasoning, where premises give only partial or probable support to conclusions. The analysis highlights the ampliative value of inductive arguments, illustrating how they broaden conceptual knowledge by introducing new information. However, the article also delves into reasons for their limited acceptance in logic, focusing on their probabilistic nature, contingency, experiential basis, and susceptibility to fallacies such as hasty generalisation, composition, false cause, and appeal to authority. Despite these criticisms, the article recognises that inductive arguments hold significant merit in scientific inquiry and everyday reasoning, contrasting with the firm, analytic nature of deductive arguments used in formal logic and philosophical analysis. The article concludes by advocating for a balanced approach in argumentation, underscoring the need to appreciate the contextual strengths and limitations of both inductive and deductive reasoning in the pursuit of effective logical analysis.

Keywords: Logic, arguments, deductive arguments, inductive arguments, fallacy

Introduction

Often times, people make claims regarding certain issues. Such claims, as a matter of fact, have dual-dimensions; they are either negations or affirmations, and are geared towards establishing standpoints with respect to any prevailing issue. This is evident in the various arguments, which often arise amongst individuals in various spheres of human existence and interrelations. Against this backdrop, we can talk of arguments as being inevitable in the human society. However, this does not mean that every argument is to be accepted without due scrutiny. Little wonder Logic; a foremost branch of Philosophy, preoccupies itself with the study of the principles, techniques or methods employed in evaluating arguments and distinguishing between good and bad, valid and invalid, deductive and inductive, as well as sound and unsound arguments (Offor, 2012:3). By the term argument, we refer to a sequence or collection of declarative sentences, either affirmative or negative, in which some sentences, known as premises, provide reasonable grounds, evidence, proof, or justification for another sentence, known as the conclusion (Polo and Thomas, 2018:179).

Central to the consideration of arguments in logic is a distinction between two kinds of arguments; namely, Deductive and Inductive arguments. This dual categorisation of arguments is owing to the nature of the inferential connections existing between the premises and conclusions of every argument. It is fitting to note here that deductive arguments are characterised by strong inferential connections; that is, premises giving total, firm or complete support to the conclusions. In contrast, inductive arguments have weak inferential connections, as their premises only give partial or probable support for the acceptance of their conclusions (Offor, 2012:9). In other words, the conclusions of inductive arguments are not logically or conclusively implied by their premises. Because of this, inductive arguments are not accepted by most philosophers, especially logicians. Thus, many philosophers (logicians), while endorsing deduction, reject induction as a philosophical method. But this is not the case with Francis Bacon and John Stuart Mill, as they are pro-induction (Offor, 2012:9). Be that as it may, inductive arguments are not to be regarded as inferior to deductive arguments, and vice versa; each is a good method in its own right, for while deduction is a good philosophical method, induction is a good scientific method (Eboh, 1996:72).

Precisely, this article is aimed at establishing some possible reasons for the unacceptability of inductive arguments in Logic. This is to further establish the relevance of proper argumentation and the necessity of deductive logic in philosophy. Herein, deductive and inductive arguments are extensively discussed. Thereafter, the merits of inductive arguments, particularly its ampliative value, are exposed. This is immediately followed by a discourse on the unacceptability of inductive arguments in logic, with particular attention on the probabilistic nature, contingency and experiential

basis of inductive arguments, as well as some fallacies inherent in inductive arguments; namely, converse accident, composition, false cause and appeal to authority.

Ultimately, the article aims to provide a comprehensive critique of inductive arguments, highlighting their limitations while acknowledging their value in scientific inquiry and everyday reasoning. This balanced approach underscores the importance of understanding both deductive and inductive reasoning's strengths and limitations to foster a nuanced perspective on effective logical analysis.

Kinds of Arguments: Deductive and Inductive Arguments

Arguments can be categorised as either deductive or inductive based on the inferential connection between premises and conclusions. As used here, the term "inferential connection" refers to inference, which can be described as the process in which a declarative statement called the conclusion is derived from other declarative statements, known as premises. While deductive arguments fully support the conclusion with their premises, inductive arguments provide only probable support (Polo and Thomas, 2018:185). Again, in deductive arguments, specific conclusions necessarily follow from general premises (Agbonkpolo, 2004:46). In contrast, inductive arguments infer general conclusions from specific premises, with the general conclusion being likely but not certain based on the specific examples (Agbonkpolo, 2004:46).

Some examples of deductive and inductive arguments are given below:

Deductive Arguments
1. All ruminants have four-compartment-stomach (premise).
   Goats are ruminants (premise).
   Therefore, Goats have four-compartment-stomach (conclusion).
2. All professors are graduates (premises).
   Angela is a professor (premise).
   It follows therefore that Angela is a graduate (conclusion).

Inductive Arguments
1. John is a graduate and has a white-collar job (premise).
   Benedict is a graduate and has a white-collar job (premise).
   Michael is a graduate and has a white-collar job (premise).
   Hence, most probably, all graduates have white-collar jobs (conclusion).
2. Patrick uses glasses and is intelligent (premise).
   Monica uses glasses and is intelligent (premise).
   Luke uses glasses and is intelligent (premise).
   Thus, all persons who use glasses are intelligent (conclusion).

From the examples above, we can see that deductive arguments feature a strong inferential connection between their premises and conclusions. In these arguments, the premises offer conclusive reasons or evidence for the conclusion, so accepting the premises means the conclusion must also be accepted. Conversely, inductive arguments exhibit a weaker inferential connection between their premises and conclusions. The premises in inductive arguments provide only probable support, not conclusive reasons, for the conclusion. Therefore, accepting the premises of an inductive argument does not necessarily lead to accepting the conclusion.

Merits of Inductive Arguments: Ampliative Value of Inductive Arguments

As earlier averred, the conclusions of deductive arguments are necessarily implied by their premises. That is, the conclusions of deductive arguments merely spell out what is already contained implicitly in the premises, and do not go beyond that (Aja, 1992:21). This simply means that deductive arguments are explicative and analytic, so that their conclusions contain no new information. All that is asserted in the conclusions of deductive arguments is already implied by the premises. Below is an example of deductive arguments:

Every bachelor is unmarried (premise).
Joseph is a bachelor (premise).
Therefore, Joseph is unmarried (conclusion).

From the argument above, we observe that the concept of bachelor already implies or presupposes being unmarried, so that when related to Joseph, we cannot but conclude that Joseph is unmarried. Conversely, inductive arguments have conclusions which are not necessarily implied by their premises. That is, inductive arguments often have conclusions which go beyond the evidence offered in the premises. They contain new information that is not present, even implicit in their premises (Salmon, 2011:91). Therefore, inductive arguments are ampliative; that is, they broaden conceptual knowledge by adding new information. The conclusion of inductive arguments, if true, will add to our knowledge of the world. Thus, induction is a method of discovery (Oke and Amodu, 2006:33). This accounts for the ampliative value of inductive arguments. The following shows the ampliative value of inductive arguments:

> Yam, Potato and Cocoyam all taste well when cooked and contain carbohydrate (premise 1).
> Yam and Potato give us energy when eaten (premise 2).
> Therefore, Cocoyam will probably give us energy when eaten (conclusion) (Oke and Amodu, 2006:101).

From this argument, we observe that the conclusion: (Therefore, Cocoyam will probably give us energy when eaten), is not contained in either premise 1 (Yam, Potato and Cocoyam all taste well when cooked and contain carbohydrate), or premise 2 (Yam and Potato give us energy when eaten), but is analogically induced from the shared properties of Yam, Potato and Cocoyam. Precisely, here, there is a movement from the recognition that Yam, Potato and Cocoyam all taste well when cooked and contain carbohydrate to the conclusion that Cocoyam will probably give us energy when eaten, since Yam and Potato both give us energy when eaten.

Some Reasons for the Unacceptability of Inductive Arguments in Logic

As earlier stated, inductive arguments have weak inferential connections, as the truth of their premises does not necessarily guarantee the truth of their conclusions. In this regard, we talk of inductive arguments as being probabilistic and contingent, and as having an experiential basis and some inherent fallacies. These account for their unacceptability in the domain of logic.

(a) Probabilistic Nature of Inductive Arguments

Since the conclusions of inductive arguments are not necessarily implied by the premises, but go beyond the content of the premises, we can argue that "induction loses the certainty of its conclusion in exchange for the conclusion's informative content" (Oke and Amodu, 2006:34). This means that unlike deductive arguments, which are characterised by certainty, inductive arguments are characterised by probability (Oke and Amodu, 2006:34). "Probability connotes the idea that something is likely to happen given that certain conditions obtain" (Oke and Amodu, 2006:34). It is the likelihood of something being the case.

Probabilities can be mathematically or statistically calculated in terms of degrees, percentages, fractions or ratios, and they are either 'high' or 'low,' depending on the truthfulness of the premises (Oke and Amodu, 2006:34). That is, inductive arguments are constituted not by certainties, but by likelihoods or possibilities. The following inductive argument clearly depicts the idea of probability:

> John is a seminarian and he is holy (premise).
> Peter is a seminarian and he is holy (premise).
> Therefore, all seminarians are probably holy (conclusion).

In the above argument, we observe that the conclusion, even if not implicit in the premises, is arrived at, not on the basis of its certainty, but on the basis of the possibility or likelihood of its occurrence. This applies to all forms of inductive arguments, so that they are not unanimously accepted as proper argumentation in the enterprise of logic.

(b) Contingency of Inductive Arguments

Even if all the premises of an inductive argument are true, it does not necessarily follow that the conclusion is true (Bello, 2000:306). The conclusion may be false; reason being that it is not implied in the premises. Thus, the conclusion of an inductive argument, if true, is only true contingently, so that it can be either true or false (Oke and Amodu, 2006:34). Put simply, every inductive argument has a conclusion with truthfulness that is not definite or fixed, but varies from case to case. The following portrays the contingent nature of inductive arguments:

> On Tuesday, in Bodija, while the weather was cloudy, it rained (premise).
> On Wednesday, in Bodija, while the weather was cloudy, it rained (premise).

Therefore, since the weather in Bodija is currently cloudy, it will probably rain (conclusion). Assuming that the premises of the argument above are true, we cannot hold that the conclusion is necessarily true. The truthfulness of the conclusion is not necessarily implied by the premises, since there are two possibilities; namely that it may or may not rain.

(c) Experiential Basis of Inductive Arguments

The truthfulness of the conclusions of inductive arguments is subject to confirmation by experience or empirical verification; hence, it has to be observed, either directly or indirectly (Bello, 2000:306). That is, the conclusions of inductive arguments can only be established by means of appeal to sense perception, physical experiences, or observation; otherwise, they will remain unconfirmed. Let us consider the following example:

Throughout last week, the Seminarians of All Saints Major Seminary, Ekpoma, converged at the Chapel by 05:30am for Morning Prayer (premise).

It is 05:30am (premise).

Therefore, the Seminarians of All Saints Major Seminary, Ekpoma, are probably currently gathered in the Chapel for Morning Prayer (conclusion).

The conclusion of this argument can only be confirmed experientially; that is, one has to go and check the Chapel to see if the Seminarians are actually gathered in the Chapel for Morning Prayer, as they may not actually be in the Chapel for prayer at that point in time. They could be on vacation or possibly have an alteration in their daily program of activities.

(d) Some Fallacies Inherent in Inductive Arguments

The word 'fallacy' is a derivative of the Latin word *fallere,* which means 'to deceive' (Simco and James, 1981:247). Hence, fallacy, in its literal sense, refers to any form of deception inherent in people's statements or reasoning. "Logicians use the word fallacy to refer to errors in reasoning or arguing. They also use it to refer to arguments which fail to provide adequate evidence for their conclusions (Simco and James, 1981:247)." We may also understand fallacies as pitfalls into which any of us may tumble in our reasoning (Copi, 1982:132).We could also understand fallacies as errors committed in reasoning and argumentation, by which people are deceived or misled, or as flaws inherent in people's claims, opinions, or arguments, often caused by lack of criticality or inattentiveness on the path of the individual making such claims. By their very nature, fallacies are difficult to detect, as they appear psychologically persuasive on the surface level, so that they are often accepted without due scrutiny. However, when meticulously examined, fallacies could be detected.

Fallacies may be broadly categorised as formal and informal (Barry and Soccio, 1976:75). "Formal fallacies have to do with the violation of certain rules of valid inference" (Offor, 2012:39). By extension, formal fallacies are those usually discussed in connection with valid inference or deductive argument (Barry and Soccio, 1976:75). "Informal fallacies are commonplace errors in reasoning that we fall into because of careless language usage or inattention to subject matter" (Barry and Soccio, 1976:75).

With the concept of fallacy understood, we shall now consider some informal fallacies inherent in inductive arguments; namely, converse accident (hasty generalisation), composition, false cause and appeal to authority.

(i) Fallacy of Converse Accident (Hasty Generalisation)

The fallacy of converse accident or hasty generalisation, as it is also called, is committed when particular cases or experiences are taken as the basis for universal conclusions; that is, accidental truths are taken as the basis for general relations (Uduma, 2000:207). The fallacy of converse accident involves arguing from a particular case to a general one (Maduka, 2000:141), or generalising on the basis of insufficient evidence (Irele and Afolayan, 2012:165). It is regarded as hasty generalisation because, the evidences offered by the premises of arguments guilty of this fallacy are often inadequate, insufficient or limited, so that only a restricted or limited conclusion is warranted, and not a general conclusion.

The fallacy of converse accident is often committed in induction by simple enumeration or inductive generalisation. This is because, in induction by simple enumeration, a generalisation is arrived at by means of the observation of single episodes regardless of the fact that it is difficult, if not outrightly impossible to know all instances. Below is an inductive argument which is guilty of the fallacy of converse accident:

John is married and he is a womaniser (premise).

Peter is married and he is a womaniser (premise).

Solomon is married and he is a womaniser (premise).

Therefore, probably all married men are womanisers (conclusion).

In the argument above, the conclusion was arrived at and affirmed on the basis of some particular instances mentioned as premises. Since the instances, owing to their insufficiency, do not necessarily guarantee the truth of the conclusion, the argument becomes guilty of the fallacy of converse accident or hasty generalisation.

(ii) Fallacy of Composition

This fallacy is committed when what is asserted to be true of a part is asserted to be true of the whole (Popkin and Stroll, 1993:264). In other words, the fallacy of composition is committed when one attributes the qualities of parts to the whole (Oyeshile and Ugwanyi, 2006:148). Let us consider the following example:

Every Nigerian is rich (premise).

Therefore, Nigeria is rich (conclusion).

From the argument above, there is a movement from Nigerians, who are presented as being rich, to an affirmation that Nigeria as a country is rich, which may not really be the case. Thus, it is guilty of the fallacy of composition.

(iii) Fallacy of False Cause

This fallacy is committed when one says something is the cause of another, when in actual fact is not the case (Offor, 2012:46). In other words, "People are guilty of the false cause fallacy when they mistake what is not the cause of a given event for its real cause" (Eboh, 1996:18). This fallacy has two strands; namely, *Non causa pro causa*; meaning the questionable cause or causal fallacy, and *Post hoc ergo propter hoc;* a Latin phrase for "after this, therefore, because of this." The former occurs when what is not the cause of a given effect is mistaken for its real cause. The latter occurs when an event is regarded as the cause of another, simply because it occurred first and was immediately followed by the other (Offor, 2012:47).

The fallacy of false cause is often committed in causal induction. This is so because, in causal induction, the correlation, connection or relationship between two or more events is used as the basis for defining the necessary succession of one of the events by the other, so that the preceding event becomes the cause, while the succeeding event the resultant effect. Below is an inductive argument which is guilty of the fallacy of false cause:

Whenever a child cries, he/she is hungry (premise).

Mrs. Ohwerhi Evelyn's child is crying (premise).

Therefore, Mrs. Ohwerhi Evelyn's child is probably hungry (conclusion).

The above argument is guilty of the fallacy of false cause because, it assumes that whenever a child cries, then he/she is hungry; so that the child's feeling of hunger becomes the only cause of his/her cry. This is not always the case. There are exceptional cases where a child cries not because he/she is hungry, but because he/she needs attention, wants to be carried or pampered.

(iv) Appeal to Authority *(Argumentum ad Verecundiam)*

This fallacy is associated with induction by authority. It is committed when one attempts to cause a person to assent to a conclusion by appealing to statements aimed at arousing the feeling of respect that he/she has for a famous person, a cherished tradition, or the weight of number (Oke and Amodu, 2006:118). It is noteworthy that, this fallacy is only committed when a wrong authority is cited or quoted in relation to a field which is different from his/hers. It is not committed when an expert is quoted in his own special field (Maduka, 2000:140). For instance, if one quotes Plato when discussing an ideal state, the appeal to authority made here is relevant and could be accepted, since Plato himself is an expert in this domain. Below is an inductive argument which commits the fallacy of appeal to authority:

Kano Nwankwo likes peak milk (premise).

Therefore, peak milk is good for everyone and should be taken by everyone (conclusion).

The above argument is fallacious on the ground that it appeals to Kano Nwankwo, who is not an expert or authority in the area of milk production and distribution. Kano Nwankwo being a footballer of great repute can be validly cited in the domain of football.

Conclusion

In conclusion, while inductive arguments possess significant merits, particularly their ampliative value in contributing new information and broadening our understanding, their acceptance within the domain of logic is limited. This limitation stems from the inherent characteristics of inductive reasoning: its probabilistic nature, contingency, experiential basis, and susceptibility to various fallacies.

Inductive arguments, unlike deductive ones, provide conclusions that extend beyond the premises, offering probabilistic rather than certain conclusions. This probabilistic nature, although useful in scientific and everyday contexts, results in conclusions that are not definitively supported by their premises, making them contingent upon empirical verification. The necessity for experiential confirmation further diminishes their reliability in purely logical terms.

Moreover, the presence of fallacies such as hasty generalisation, composition, false cause, and appeal to authority further undermines the credibility of inductive arguments. These fallacies reveal the pitfalls of relying on inductive reasoning without rigorous scrutiny, as they can lead to erroneous and misleading conclusions.

Despite these critiques, it is crucial to recognise that inductive arguments are not inherently inferior to deductive ones. Each serves its purpose effectively within its respective domain—induction in scientific inquiry and everyday reasoning, and deduction in formal logic and philosophical analysis. The interplay between these forms of reasoning enriches our overall understanding, highlighting the importance of context in evaluating the strength and validity of different types of arguments.

Finally, this critique of inductive arguments underscores the necessity for careful examination and a balanced approach in argumentation. By acknowledging the strengths and limitations of both inductive and deductive reasoning, we can cultivate a more nuanced and comprehensive perspective on the principles and methods that underpin effective logical analysis.

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References

Agbonkpolo, M. U. *A Simple Guide to Philosophy and Logic for Beginners*. Benin City: King David's. 2004.

Aja, E. *Logic and Clear Thought: An Invitation to Good Reasoning.* Enugu: Oak Publishers   Ltd. 1992.

Barry, V. E. and Soccio, D. J. *Practical Logic.* Third Edition. Orlando, Florida: Holt Rinehart and Winston Inc. 1976.

Bello, A. G.A. *Introduction to Logic.* Ibadan: University Press PLC. 2000.

Copi, I. M. *Introduction to Logic.* Sixth Edition. New York: Macmillan Publishing Co. Inc. 1982.

Eboh, M. P. *Introduction to Clear and Correct Reasoning.* Port Harcourt: Paragraphics. 1996.

Irele, D. And Afolayan, A. (eds.). *Philosophy and Logic: A Critical Introduction. A Textbook for GES 106.* Revised Edition. Ibadan: The General   Studies Programme Unit, University of Ibadan. 2012.

Maduka, C. (ed.).*Philosophy and Logic: A Primer.* Benin City: Department of History, University of Benin. 2000.

Offor, F. *Essentials of Logic.* Revised Edition. Ibadan: Bookwright Publishers. 2012.

Oke, M. and Amodu, A. *Argument and Evidence: An Introduction to Critical Thinking.* Ibadan: Hope Publications Ltd. 2006.

Oyeshile, O. A. And Ugwanyi, L. O. *Elements of Philosophy and Logic*. 2nd Edition. Benin: Timeless Publishers. 2006.

Polo, P. E. and Thomas, J. "Basics of Logic," in Izibili, M. A., Isanbor, P. O.,   and   Attoh, S. U. (Eds.), *Studies in Philosophy and Society: Book   of   Readings*, Vol.   1.   Kagoma, Kafanchan, Kaduna: Department of Philosophy, Albertine Institute. 2018.

Popkin, R. H. and Stroll, A. *No Nonsense Knowledge: Philosophy Made Simple: A Complete Guide to the World's Most Important Thinkers and   Theories.* Second   Edition.   Revised.   New York: Three Rivers Press. 1993.

Salmon, M. H. *Introduction to Logic and Critical Thinking.* 6th Edition. International Edition. Pittsburg: Wadsworth/Cengage Learning. 2011.

Simco, D. N. and James, G. G. *Elementary Logic.* Second Edition. Belmont: Wadsworth Publishing Company. 1981.

Uduma, U. O. *The Fundamentals of Philosophy.* Abakaliki: Willy Rose and Appleseed Publishing Coy. 2000.