UNIT 1: PROBLEM OF INDUCTION

UNIT STRUCTURE

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1.1 Learning Objectives

After going through this unit, you will be able to

- Know the meaning of reasoning
- Classify the fundamental kinds of argument
- Describe the nature of induction and its probabilistic nature
- Illustrate Hume's view on the problem of induction
- Describe different approaches towards the solution of the problem

1.2 Introduction

This unit introduces to you the problem of induction formulated by David Hume and other philosophers' approach towards the problem. This is the problem of

justifying the induction. Logic, a branch of Philosophy, is described as the science of reasoning. Reasoning is a mental process passing from something known to something unknown. Reasoning when expressed in language is called an argument. Arguments are traditionally divided into two different types- Deductive and Inductive. In deductive argument the conclusion cannot be more general than the premises. It is an inference from general to particular. The premises of deductive argument are assumed to be true and it claims that its premises provide conclusive grounds for its conclusion. For example,

All humans are mortal

Socrates is human

Therefore, Socrates is mortal

On the other hand, in inductive argument, we move from the particular to the general. Here, a general proposition is established as its conclusion on the basis of some observed facts. This process of arriving at a universal conclusion from facts about particular samples is called inductive generalization.

For example,

Ram is mortal

Hari is mortal

Jadu is mortal

Madhu is mortal

Therefore, all men are mortal

Thus, it is observed that the conclusion of induction is not contained in the premises. The conclusion of induction goes beyond the premises. Hence, its conclusion gives new information.

Unlike deductive argument, the premises of inductive argument provide some support, but not the conclusive grounds for the truth of its conclusion. So, the conclusion of induction is always probable.

Concerning the nature of induction that it establishes a general proposition as its conclusion on the basis of particular observed facts,David Hume first raised

the question that under what conditions we are justified in inferring the general from the particular, or the more general from the less general? Hume formulates the problem of induction in his famous work *A treatise of Human Nature*s "*having in the past observed certain regularities is no guarantee that in the future such regularities will hold*". But Hume suggests no solution to the problem of induction, only he is skeptical to the solution. Of course, Hume does not reject the role of induction in logic and in everyday life. His point simply is that induction is based on our rational beliefs not on rational justification. To the solution of the problem, there are some modern approaches which instead of solving the problem attempt to redefine induction. Indeed, induction plays a significant role in logic, scientific inquiry as well as in our everyday life.

1.3 Nature of Logic

Logic is generally defined as a science of reasoning. Logic is connected to reasoning in a special way. The etymological meaning of the word logic shows this connection. The English word Logic is derived from the Greek word Logos, which roughly means 'reasoned discourse' or 'a systematic study' or 'thought' or 'word' as the expression of thought. In Logic 'reasoning' is substituted for 'thought'. Of course, all thinking is not reasoning, but reasoning is thinking.

Logic is different from other subjects namely Anthropology, Biology, Psychology and others though each of these studies end with 'logy'.(meaning the residual of the root 'Logos'). The difference is observed on the point that others subjects are reasoned discourses about specific domain other than reason but logic is not a reasoned discourse about some other domain; it is a discourse on 'reasoning' itself. For example, Biology is concerned with life, but Logic is primarily concerned with reasoning, its nature, kinds, methods and proof procedures for demonstrating the validity of reasoning. Thus, logic is defined as the study of the methods and principles used to distinguish good (correct) reasoning from bad (incorrect) reasoning.

Like many other studies, logic has developed in many directions. Today, logic is considered as a branch of both philosophy and mathematics. Its applications

are well known in the area of artificial intelligence, computer science and in daily critical thinking to solve complex problems.

Classical logic is the traditional system of logic formulated by Aristotle. It is also known as formal logic as it is primarily concerned with the structure or forms of reasoning and formal concepts. Symbolic logic is a development of Aristotelian logic. It is a relatively recent logic which has strong connection with mathematics. In symbolic logic there is an extensive use of symbols. Hence, this logic is referred to as modern logic, symbolic logic or mathematical logic.

1.4 Reasoning

Reasoning is a process of knowing that we use for inferring what is not directly given. It is a fundamental human mental activity used for acquiring knowledge. Reasoning is a basic epistemic activity by which we elicit more information from what is already known. It is a special kind of thinking in which problems are solved, in which inference takes place.

When reasoning is expressed in language, is called an argument. That is, corresponding to every possible inference, there is an argument. Logic is chiefly concerned with argument. An argument is a group of propositions of which conclusion is claimed to follow from the others, which are its premises. It is usual to divide argument into Deductive and Inductive.

Both deductive and inductive arguments involve the claim that its premises provide some grounds for the truth of its conclusion, but only a deductive argument involves the claim that its premises provide conclusive ground for its conclusion. But the premises of inductive argument provide some support, not the conclusive grounds for the truth of its conclusion.

Further, inductive argument is different from deductive argument as it non-monotonic. But deductive argument is monotonic. Monotonic means no additional information will have in the conclusion while non-monotonic means the new information can change the strength of the inductive argument.

1.4.1 Deductive Argument

In deductive argument the conclusion cannot be more general than the premises. It is an inference from general to particular. In Deductive argument, the premises are assumed to be true and we merely aim at Formal truth.

A Deductive argument may be characterized either valid or invalid. When the reasoning in a deductive argument is correct, we call that argument valid and when the reasoning is incorrect, we call invalid argument. A deductive argument is known as **sound** if and only if it is valid and all of its premises are true. In a valid deductive argument, if all its premises are true, then its conclusion must be true. In other words, the joint truth of all the premises of a good deductive argument guarantees the truth of the conclusion. For example,

All human beings are mortal

All Indians are human beings

Hence, all Indians are mortal

This is a good deductive argument. Here, the truth of the conclusion is already contained in the truth of the premises. That is, the premises provide conclusive support of the conclusion. Conclusive support means support which leaves no room for doubt for the truth of the conclusion. Those which fail to demonstrate support conclusively for their conclusion are considered as bad deductive arguments.

1.4.2 Inductive Reasoning

Inductive logic applies inductive reasoning. Inductive reasoning is a type particular type of logical reasoning where we try to infer something new that is not covered by the premises. That is, in induction we proceed from known premises or from observed cases to unknown or unobserved cases. Here, a general proposition is established as its conclusion on the basis of some observed facts. This process of arriving at a universal conclusion from facts about particular samples is called inductive generalization. This method is inherently empirical relying on observed data.

In contrast to deductive argument, the conclusions of inductive arguments go beyond that which is covered, explicitly or implicitly by the premises. This is known as the inductive leap which is regarded as the essence of induction. It is the unique characteristic of induction. Inductive leap is a leap or jump from the known to the yet unknown or from the cases observed to the yet unobserved cases. When we reason inductively, we always jump from the premises to a new one which is always a probable conclusion. For example, 'Tomorrow the Sun will rise in the East'- this conclusion is reached by inductive reasoning. Because, though no one of us has seen, yet on the basis of our past experience, we may conclude that tomorrow the Sun will rise again in the East. Similarly, 'All crows are black', 'All swans are white' are some of the examples of inductive reasoning.

Let Us Know

- Monotonic means additional information will have no bearing on the truth of the conclusion of the argument. On the other hand, non-monotonic means new information can change the strength of an argument.
- Deductive reasoning is monotonic while induction is non-monotonic.

1.5 Probabilistic Nature of Induction

From the various examples of induction, it is observed that the premises of inductive arguments provide some good basis to draw the conclusion but none of them provide conclusive support for the truth of the conclusion. The joint truth of all the premises can at best provide partial support for the truth of the conclusion. This point shows one of the major differences between deductive and inductive arguments. In a valid deductive argument conclusion necessarily follows from the premises. But this is not the case with induction. Even in a good inductive argument, conclusion does not necessarily follow from the premises. The premises of induction provide probabilistic support of the conclusion. But it is significant that, if the evidence of the premises is stronger, the inductive argument will be better. Better inductive arguments will provide stronger probabilistic support for their conclusion while worse inductive arguments will provide weaker. However, at best a good inductive argument

can provide a very high degree of probability, but can never yield conclusive support. But for this reason, we cannot say that inductive argument is unusable. Rather, we use them in our everyday life and also in sciences.

1.6 Problem of Induction

The problem of induction is a problem that questions about the rationality of predictions about unobserved facts based on previous observations. Scottish philosopher David Hume first gave the classic formulation of the problem of induction. There are two variants of the problem-the first appeals to the uniformity observed in nature, and second appeals to the reliance on the necessary connection between cause and effect.

Induction seeks to establish the material truth of universal real proposition. But experience furnishes us only with particular facts not with universal proposition. For example, Newton observed that an apple falls to the ground; possibly he observed other apples fall, some other fruits fall, some leaves fall, some other material bodies fall, but he could not observe all material fall to the ground. But from these experiences of particular facts induction establishes general proposition that' all material bodies to the ground'. The general propositions, when established, not only embrace the cases which have come into experience but all similar cases, experienced or not. Thus, we conclude – 'Men are mortal' from the experience of the dead of some men, similarly we may conclude all material bodies attract one another and so on. In all cases we observe small number of instances. Of course, sometimes it may happen that the careful examination of a single case is sufficient to justify a universal conclusion.

This process of arriving at a universal conclusion from facts about particular samples is called inductive generalization. It is the unique feature of induction and particularly of induction by enumeration. It is the function of Induction to enquire into and determine the conditions under which generalizations are valid. Under what conditions such inference of universal laws becomes legitimate, further how we are justified in inferring the general from the particular, or the

more general from the less general? All these questions involve the problem of Induction.

Mill formulates the problem of induction in the following way: "Why is a single instance, in some cases, sufficient for a complete induction, while in others myriads of concurring instances, without a single exception known or presumed, go such a very little way towards establishing a universal proposition? Whoever can answer this question knows more of the philosophy of Logic than the wisest of the ancients and has solved the problem of Induction."

Generally, it is observed that the problem can be solved when induction relies on two fundamental principles viz. the Law of the Uniformity of Nature and the law of Causation. The law of Causation states that every event has a cause and the Law of Uniformity states that same cause produces the same effect under similar circumstances.

On the basis of the observation of particular instances of death, in scientific induction, a causal connection is established between 'humanity' and 'mortality'. Based on the Law of Causation, scientific induction establishes this causal connection. Further, it is assumed that this causal connection is true in all cases, under similar circumstances which is based on the Law of the Uniformity of nature. and then it is concluded that 'all men are mortal'.

1. 7 Hume's View on Problem of Induction

Scottish philosopher David Hume first formulated the problem of induction in his famous work *A Treatise Human Nature* within his discussion on the nature of causes and effects in 1739. A shorter version of the argument was given in his famous book *An Enquiry Concerning Human Understanding* in 1748. Hume doubted the validity of generalization and formulates the problem of induction on the ground that "*having in the past observed certain regularities is no guarantee that in the future such regularities will hold*". In other words, we cannot apply a conclusion about a particular set of observations to a more general set of observations. For Hume, there is no logical justification for inductive reasoning. Hume argues that we cannot logically prove that future will

resemble the past despite our habit of expectation. We believe that the sun will rise in future like the past. This belief is based on our repeated past experience which has no logical certainty. Deductive logic arrives at a conclusion with certainty, but inductive logic arrives at probable conclusion. Hume argued that there is no non-circular way to justify inductive inferences, but he acknowledged that everyone does and must make such inferences. We may describe Hume's problem in the following way:

- First, the problem lies on the question of the justification of drawing conclusion about unobserved instances from observed instances. This problem is related to induction
- Secondly, problem lies on the question of the reliability of the principle of the uniformity of nature. For Hume, to justify induction we appeal to the uniformity of nature. But how do we know that nature is uniform? We know it by observing the past uniformity. That is, we assume that future will be like the past because it has been like the past. This justification leads to circular argument.
- Thirdly, the problem lies on the fact that there is no logical basis for proving induction. For Hume our belief is not based on logical proof but on **habit or custom.**

1.8 Problem of Induction and Uniformity of Nature

Induction is based on assumption that the future will follow the action that it followed in the past. In other words, nature will act uniformly as in the past. For example, the sun will rise tomorrow as it has risen every day in the past. This assumption is known as uniformity. This principle is the backbone of the induction. Based on this principle we proceed from observed to unobserved. When we inductively reason that it will rain because there are dark black clouds in the sky, our faith assumes of uniformity of nature.

David Hume's view in this regard is very significant. Hume saw a problem for induction in this assumption. He raised questions, how human beings form opinions or conclusions about matters of fact that

they have not yet observed? Hume's answer to this question is, our previous plays an important role in the formation of such knowledge. Hume claimed that out of the past experiences we arrive at opinions about the unobserved by ***induction***. Hume's next legitimate question is: *How safe or justified is our faith in proceeding by induction to form opinions about induction?*

For Hume, Uniformity of Nature plays the great role in the process of arriving inductive conclusion. If something occurs regularly or uniformly in nature in the past, then we can expect that they will hold also in the future. Hume thought that we are not sceptic about our faith in the uniformity of nature. But, how do we know that uniformity of nature will hold? What reason do we have to place faith in uniformity of nature? Hume argued that we have no good reason at all. Hume thought that uniformity of nature has been seen to work in the past, but its unobserved behavior in future is not known. Further, it is quite possible that we may find opposite happening. It is also possible that the regularities that we have observed may not hold in future.

However, Hume views that uniformity of nature serves as a hidden ***premise*** in induction. Induction uses uniformity of nature. So, there is no legitimate ground to say that uniformity of nature is the ***conclusion*** of induction. If so, this justification will lead to circular argument.

But Hume does not reject the role of induction in logic and in every day life. Inductive reasoning operates both in scientific inquiry and everyday life. His point simply is that induction is based on our rational **beliefs** not on rational logical justification. Hume believed that induction is based **on custom and psychological habit**. Hume's analysis is that the belief in cause and effect or the future will resemble the past is a psychological habit, not a truth guaranteed by reason or experience. However, the probabilistic nature of induction helps us to be more cautious and critical in the process of generalization recognizing its inherent limitations.

1.9 Modern Approaches to the Solution of the Problem

Hume's problem of induction is ended with skeptical solution. Hume offers no solution to the problem of induction, only he is skeptical to the solution. Hume's suggestion is that we rely on induction for practical reason.

A number of philosophers have attempted to solve the problem. Some of the solutions are- Karl Popper's falsificationism, Bayesian probability, and pragmatic justifications.

Popper's approach towards the problem is expressed in ***The Logic of Scientific Discovery (1959)*** where he argues that Induction is a myth and science should not and does not rely on induction to prove theories true. He argued that scientific laws cannot be derived from particular observations. For example, 'All swans are white' cannot be proved from the observation of some white swans, because one black swan can disprove it. Instead of seeking to prove theories, scientists should attempt to refute them. Popper's solution is to replace inductive inference with deductive testing.

Immanuel Kant addresses the problem by arguing that the principle of induction and the law of cause and effect are synthetic a-priori. They provide new information. They are not derived from experience; rather they are the necessary preconditions for experience. Kant does not provide a deductive proof for every future event but provide a framework where induction is considered as a constitutive part of human objective understanding.

The materialist view argues that inductive inferences are justified by the local facts of the domain, not by a universal, unjustifiable inductive rule.

It is observed that most of the approaches to the solution attempt to redefine the goal of induction, instead of solving the inherent problem of induction. Indeed, induction has a great philosophical importance.

Activity 1

1. Write an essay on the problem of induction.

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CHECK YOUR PROGRESS

Q 1. What are the fundamental kinds of reasoning?

Q 2. What is inductive reasoning?

Q 3. What is inductive generalization?

Q 4. What is an inductive leap?

Q 5. What does the Law of Uniformity of Nature state?

Q 6. What is the problem of induction?

Q 7. Explain the nature of inductive reasoning.

Q 8. Why is inductive reasoning called probabilistic?

Q 9. How did David Hume explain the problem of induction?

Q 10. Mention one modern approach to the problem of induction.

1.10 Let us Sum up

- Logic is generally defined as a science of reasoning. It is usual to divide argument into Deductive and Inductive. In deductive argument the conclusion cannot be more general than the premises. It is an inference from general to particular. But in induction we

move from particular to general. Here, a general proposition is established as its conclusion on the basis of some observed facts.

- A deductive argument involves the claim that its premises provide conclusive ground for its conclusion. But the premises of inductive argument provide some support, not the conclusive grounds for the truth of its conclusion.
- In the philosophical discussion of induction, the problem of induction occupies a significant place which is one of the enduring problems of epistemology. This is the problem of justifying the induction.
- The classical problem of induction is raised by David Hume. Hume raised the problem as: What reason do we have to believe that our conclusions about observed instances may be extended to include unobserved instances? or what reason do we have to think that we can draw reliable conclusions about future unobserved instances on the basis of past observed instances?
- Hume claimed that out of the past experiences we arrive at opinions about the unobserved by ***induction***. Hume's next legitimate question is: *How safe or justified is our faith in proceeding by induction to form opinions about induction?*
- For Hume, Uniformity of Nature plays the great role in the process of arriving inductive conclusion. If something occurs regularly or uniformly in nature in the past, then we can expect that they will hold also in the future. But, how do we know that uniformity of nature will hold? What reason do we have to place faith in uniformity of nature?
- Hume argued that we have no good reason at all. Hume thought that uniformity of nature has been seen to work in the past, but its unobserved behavior in future is not known. Further, it is quite possible that we may find opposite happening.
- Hume's view that uniformity of nature serves as a hidden ***premise*** in induction. Induction uses uniformity of nature. So, there is no

legitimate ground to say that uniformity of nature is the ***conclusion*** of induction. If so, this justification will lead to circular argument.

- Hume's point is that induction is based on our rational **beliefs** not on rational logical justification. Hume believed that induction is based **on custom and psychological habit**.
- Hume's problem of induction is ended with skeptical solution. His suggestion is that we rely on induction for practical reason.
- A number of philosophers have attempted to solve the problem. most of the approaches to the solution attempt to redefine the goal of induction, instead of solving the inherent problem of induction.
- Indeed, induction has a great philosophical importance in logic, scientific inquiry as well as in our everyday life.

Activity 2

1. Discuss modern philosophers' approaches towards the solution of the problem of induction.

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Activity 3

Can the problem of induction be solved?

Give your own view points.

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1.11 Further Readings

1. Avi Sion (2008): Hume's Problems with Induction, published by Avi Sion in Geneva, Switzerland

2. Chakraborty, Chhanda (2007): Logic-Informal, Symbolic and Inductive, Prentice Hall of India, Private Ltd., New Delhi.
3. B. N. Ray: Textbook of Inductive Logic
4. I.M. Copi, & Carl Cohen(1995): Introduction to Logic, Prentice Hall of India, Private Ltd., New Delhi

1.12 ANSWER TO CHECK YOUR PROGRESS

Q 5. What Ans to Q 1: The two fundamental kinds of reasoning are **deductive** and **inductive** reasoning. Deductive reasoning moves from general to particular and gives certain conclusions, while inductive reasoning moves from particular to general and gives probable conclusions.

Ans to Q 2: Inductive reasoning is a type of reasoning where we move from specific observations to general conclusions. It does not guarantee truth but provides probable support based on evidence.

Ans to Q 3: Inductive generalization is the process of forming a universal statement based on a limited number of observed cases. For example, observing several humans are mortal and concluding all humans are mortal.

Ans to Q 4: An inductive leap is the jump from observed cases to unobserved cases. It goes beyond the given evidence and forms a general conclusion, making induction uncertain but useful.

Ans to Q 5: It states that nature behaves consistently; the same causes produce the same effects under similar conditions. It assumes that the future will resemble the past.

Ans to Q 6: The problem of induction questions how we can justify drawing general conclusions about unobserved cases based on past observations, since such conclusions are not logically certain.

Ans to Q 7: Inductive reasoning is empirical and probabilistic. It is based on observation and experience and leads to general conclusions that go beyond the premises. It is non-monotonic, meaning new evidence can change the conclusion.

Ans to Q 8: Inductive reasoning is called probabilistic because its conclusions are not certain but only likely. Even strong evidence cannot guarantee truth, only a high degree of probability.

Ans to Q 9: David Hume argued that we cannot logically justify induction. Our belief that the future will resemble the past is based on habit, not reason, making induction uncertain and circular.

Ans to Q 10: Karl Popper proposed falsifications, which rejects induction and suggests that scientific theories should be tested by trying to prove them false rather than true.

1.13 Model Questions

(A) Very short questions

Q.1 What are the fundamental kinds of reasoning?

Q. 2 What is inductive reasoning?

Q. 3 What is inductive generalization?

Q. 4 What is inductive Leap?

Q.5 What does the Law of Uniformity of Nature state ?

Q. 6 What is the problem of induction?

(B) Short questions (Answer each Question in about 100-150 words)

Q.1 Describe the nature of induction

Q.2 Inductive reasoning is non-monotonic. What does it mean?

Q.3 Explain the problem of induction

Q.4 How does Hume formulate the problem of induction ?

Q. 5 Explain how induction is based on the Law of Uniformity of Nature

(**C) Long Questions (**Answer each Question in about 300-500 words)

Q.1 Explain the nature of deductive and inductive argument

Q.2 Explain Hume's view about the problem of induction

Q.3 Discuss modern philosophers' view about the problem of induction

Q.4 Write an essay on the problem of induction.

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