

Designing of a Hypothesis

Shirish Limaye,

Symbiosis College of Arts & Commerce, Senapati Bapat Road, Pune 411 004,
Maharashtra, India

Abstract

Many a times the novice researchers find it difficult to formulate a hypothesis because they are not aware about various elements of hypothesis. This research article is focused on explaining the fundamental elements of hypothesis in a lucid language and with simple practical examples. Besides focusing on designing of hypothesis and explaining how to express the hypothesis in mathematical terms, it also covers two important concepts viz. An Assumption and A Claim. This research article will end by explaining how a hypothesis is tested. This research article is written for helping the freshers to generate interest in the process of research.

I INTRODUCTION

In this research article is focused on designing of hypothesis. It includes meaning, features, mathematical expression and testing of hypothesis. The objective of this research paper is to simplify the basics of hypothesis formulation by using day-to-day life examples. This research article is written for helping the freshers to generate interest in the process of research.

II PROCESS OF SCIENTIFIC RESEARCH

The process of scientific research involves the following steps :

1. Observation
2. Hypothesis formulation
3. Experiment
4. Data analysis
5. Conclusion

In this process, formulation of hypothesis is an important step. This research paper is focused on how hypothesis is developed.

III WHAT IS A HYPOTHESIS?

Hypothesis is defined by Merriam Webster Dictionary as an idea or theory that is not proven but that leads to further study.

1. It is an assumption or concession made for the sake of an argument.
2. It is an interpretation of a practical situation or condition taken as the ground for action.
3. It is a tentative assumption made in order to draw out and test its logical or empirical consequence.
4. It is the antecedent clause of a conditional statement.

To sum up, it can be said that “Hypothesis is a supposition or a supposed solution or prediction to a particular scenario” It is a prediction statement, a structured type of prediction statement.

IV COMPONENTS OF HYPOTHESIS

Two key components of Hypothesis

Hypothesis has two important key components. :

1. An experimental variables, which includes both,
 - a. A dependant variable and
 - b. An independent variable.
2. Hypothesis must be measurable / testable in some way.

Now, let us take an example to understand these components of a Hypothesis. Sitting on the bank of a lake, Miss. Shweta was curious to know the behaviour of the fish in the water. She observes that there are many fish in the lake. These fish sometimes leap from the water. She also observed that there are some items such as pieces of bread, tea cups and snakes, etc. She also observed that the fish may know these items. Now, in order to study the behaviour of fish in the water, Miss. Shweta identified two experimental variables :

- A. Dependent variables : Fish is the dependent variable. Miss. Shweta is interested in knowing the behaviour of fish in the water.
- B. Independent variables : Anything that influence the behaviour of the fish will be independent behaviour e.g. Miss. Shweta herself, the base of the bridge that is rooted in the water, the snakes, tea cups, pieces of bread etc. are independent variables.

Hypothesis 1 : “Fish sometimes behaves strangely in lake”

Miss. Shweta has to write a testable hypothesis or a measurable hypothesis suppose she writes a hypothesis like this : **“Fish sometimes behaves strangely in lake”**

What is the problem in having this hypothesis? Problem here is that we have a dependent variable but we do not have an independent variable. It is impossible to measure how ‘strangely’ something is behaving.

Hypothesis 2 : “The fish leap from the water when there are pieces of bread nearby.”

Now, suppose Miss. Shweta develops another hypothesis : **“The fish leap from the water when there are pieces of bread nearby.”** This is a pretty good hypothesis. Because there is a dependent variable: Fish and an Independent variable: Pieces of bread. So she can test the hypothesis by throwing the pieces of bread and watching the way the fish behaves.

Hypothesis 3 : “If we move or stir the water violently, (thrash it) the fish are more likely to jump up and down”

This hypothesis sounds good, but the word “thrash” is a general term. It is not specific. Moreover, it is difficult to measure. So she should have used some other specific independent variable such as say tea cups etc. rather than using the word “thrash”.

Hypothesis 4 : “If there are predators like snakes nearby, the fish will jump from the water.”

This hypothesis is much better, we have an independent variable i.e. snakes and a dependent variable i.e. fish. We can testify the behaviour of the fish by adding a lots of snakes to the water.

Hypothesis : how to express it mathematically?

V. “AN ASSUMPTION” AND “A CLAIM”

For the purpose of understanding the nature of hypothesis, it is important to know these two concepts. Now let's understand two important terms in research viz. “An assumption” and “A claim” with the following two examples :

Example 1 : BOTTLED WATER

Hypothesis is an educated guess. Let's take an example to understand this sentence. Suppose a bottle water manufacture is manufacturing a water bottle which contains 500 ml. Since this information is printed on the water bottle, we assume it to be true. We assume that all the bottles on which this label is affixed, must be containing 500 ml water. But a researcher may question, is it? Is this assumption true? Does every bottle contain 500 ml of water?

On one hand as a customer our concern is that there must be at least 500 ml of water in each bottle. If there is more water, it is okay, we are getting more water in the same price! But if the water is less than 500 ml, it is a loss to the customer. So we can express this in mathematical equation, The customer assumes that there is 500 ml of water, more quantity is acceptable but less quantity is not acceptable. i.e. **Quantity of water \geq 500 ml.**

On the other hand, the concern of the manufacturer is to see to it that the volume of water in each bottle is exactly 500 ml. If it is more, it is a loss to the manufacturer. If the water filled in the water is less than 500 ml, it will upset the customer's expectations. So, as a manufacturer, he will neither be interested in under filling or over filling the water below or above 500 ml. This can be mathematically expressed as : **quantity of water = 500 ml.**

One may observe in the above bottled water case that we are building the problem based on the actual text of the problem and we are trying to put it into mathematical expression. Now how will we carry out the experiment to test these hypotheses?

VI TESTING OF HYPOTHESIS

We will collect say 50 bottles from all over the country (or all over the world for that matter) to randomise the sample in terms of location, time, manufacturing plant, etc. Then we will measure the volume of each bottle in the sample and find the mean volume for all these 50 bottles. Thus, by using those sample means, we can test the “assumption” or the “status quo.” Here we are testing the assumption that is already printed on the water bottle.

Example 2 : HYBRID CAR ENGINE

An auto manufacturer has developed a new hybrid engine technology. They claim that the new technology reduces fuel consumption during city driving. The manufacturers claim that the new technology improves fuel efficiency and makes it better than the old engine that produces 30 miles per litre. The company will run controlled tests to look for statistical evidences to support the claim that the new engine offers better fuel efficiency than the old model. One must have carefully noticed that the company's claim is : **Fuel efficiency is \geq 30 miles per litre.**

We are testing their claim. Actual performance of the engine may be 35 miles, 40 miles or even 25 miles also. In case of water bottle example, we knew the condition that is existing in all bottles i.e. each bottle contains 500 ml of water. This was an assumption we were testing. It is called a “status quo” testing which was already in

existing. But, in Hybrid Car Engine example, we are not testing an assumption, we are testing a claim. Hence we do not know the actual answer. We are testing the claim that the manufacturer has made and which he wishes to test. It is NOT testing an ASSUMPTION that already existing.

VII CONCLUSION : THINKING ABOUT HYPOTHESIS

So, assumption is what we assume to be true. Claim means what we cannot assume to be true. If we want to test the petrol consumption listed on the current car sticker, we would be testing an assumption and not a claim.

When we are trying to formulate an hypothesis, we must ask ourselves the this question : “Am I testing an *assumption* or *the status quo*, that already exists? (water bottle example) or am I testing a *claim* or *assertion*

Reference :

Web sites :

1. <https://www.youtube.com/watch?v=VK-rnA3-41c>
2. <https://www.youtube.com/watch?v=bp2fbzWZDmA>