Approaches to Knowledge

James H. Steiger

Department of Psychology and Human Development
Vanderbilt University

PSY 2101

Psychology 2101 Introduction

1 Approaches to Knowledge

- Authority
- Intuition
- Deduction
- The Scientific Method

Approaches to Knowledge

We're studying statistics because, in some important ways, it is going to help us learn about the world. Let's begin by reviewing several ways in which we gain knowledge about ourselves and the world and people around us. We'll talk briefly about 4 basic approaches.

- Authority
- Intuition
- Deduction
- The "Scientific Method"

Authority

- Someone, an "authority figure," is assumed to know much more about something than we do.
- To gain knowledge, we ask them and/or listen to them.
- Examples:
  1. Parents
  2. Doctors
  3. High School Teachers

Authority
A Special Case – Celebrity

- The *method of celebrity* is a special case of the method of authority, in which the value of a person's opinion about something is assumed to be related to how famous they are, even if the individual has no obvious expertise in the area of discussion.
- Examples:
  1. Oprah Winfrey
  2. David Letterman
  3. James ("Jay") Leno
  4. Johnathan Leibowitz ("Jon Stewart")

Authority
A Special Case – Consensus

- The *method of consensus* is another special case of the method of authority. Here, public opinion decides which of several possible positions is correct.
- This method has taken on a new life with the advent of internet discussion groups.

Authority

- Authorities are necessary. Where would we be without our parents?
- But authorities can be dramatically wrong, even if they are well-meaning.

Example (Edward Clark)

Clarke was a member of the Harvard Medical School faculty. His book *Sex in Education; or, A Fair Chance for the Girls (1873)* was very popular, and was sold out through several reprintings.

Clarke's *theory of cephalo-pelvic disproportion* stated that women who went to high school would suffer from a diverting of energy flow from the pelvis to the brain during the critical developmental years of puberty. As a result, they would end up with big heads and small pelvises, possibly dying during childbirth or becoming hysterical, with shriveled ovaries!

Intuition and Subconscious Thought

- Can be very valuable.
- Will often lead us astray.
- Example: The birthday problem.

Example (The Birthday Problem)

- 40 people are gathered together in a room.
- Their birthdays are essentially randomly selected from the set of all days of the year.
- What is the probability that 2 or more people in the room have the same birthday?

Intuition and Subconscious Thought

On the next slide is an approximate solution to this problem, using ideas from *discrete probability theory* and *statistical programming* we'll develop later in the course. By the end of the course, what appears below will seem as simple and clear to you as $2 + 2 = 4$ (well, almost...).

Intuition and Subconscious Thought

Example (The Birthday Problem)

```
> birthday.problem <- function(n){
+ if(n>366) return(1)
+ if(n<2)   return(0)
+ cum <- 1
+ for(i in 1:(n-1)) cum <- cum*(365-i)/365
+ answer <- 1-cum
+ return(answer)
+ }
> birthday.problem(40)
[1] 0.8912318
```

It turns out that once you have 40 people in a room, the probability is almost 0.90 (odds are almost 9 to 1) that at least two people have the same birthday.

Deduction

- By proceeding from a set of initial premises using laws of logic, we can explore the implications of those premises.
- In so doing, we can learn a great deal about certain aspects of our world.
- For example, we can learn the ratio between the radius of a circle and its diameter, i.e., the number π.
- In this course, we will on occasion apply the deductive method to deduce certain things that must be true, given certain assumptions.

Deduction

Example (Deductive Logic)

1. All cats have hair.
2. Mr. Puggs is a cat.
3. Therefore, Mr. Puggs has hair.

If the first two statements above are true, then the third *must be true*!

Deduction
Detecting Logical Fallacies

Studying the rules of formal logic and mathematics can help us deduce new facts, *but also recognize fallacious arguments when we see them.*

Example (A Logical Fallacy—Affirming the Consequent)

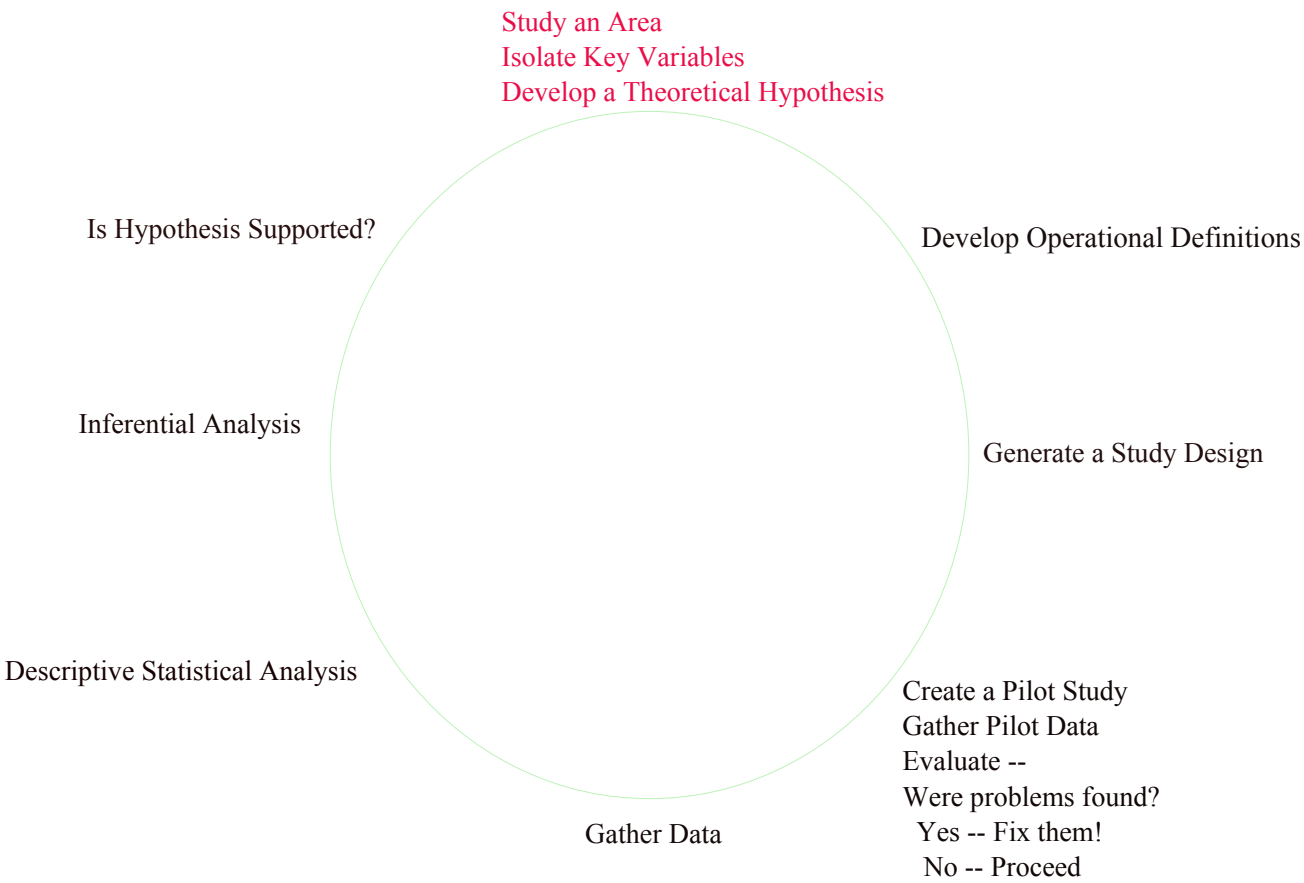
1. All cats have hair.
2. Mr. Puggs has hair.
3. Therefore Mr. Puggs is a cat.

Although the fallacy of affirming the consequent is blatantly obvious in the above example, we can often be deceived by it in more complex arguments.

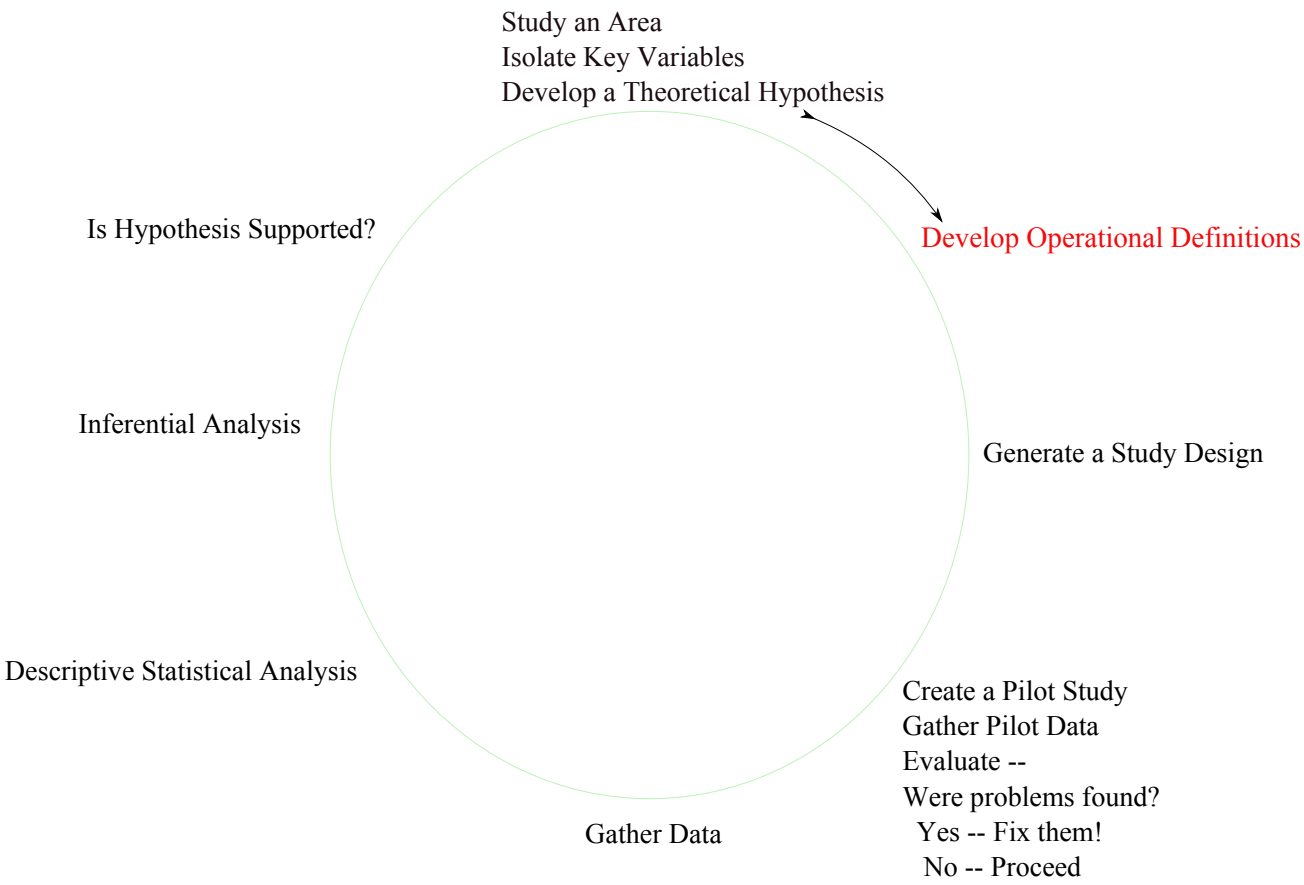
The Scientific Method

- Scientists have made tremendous progress in the last 3 centuries by employing a systematic approach to the development of knowledge.
- This approach is loosely referred to as "the scientific method" in many textbooks.
- In the following slides, we'll review fundamental aspects of this approach.

The Scientific Method



The Scientific Method



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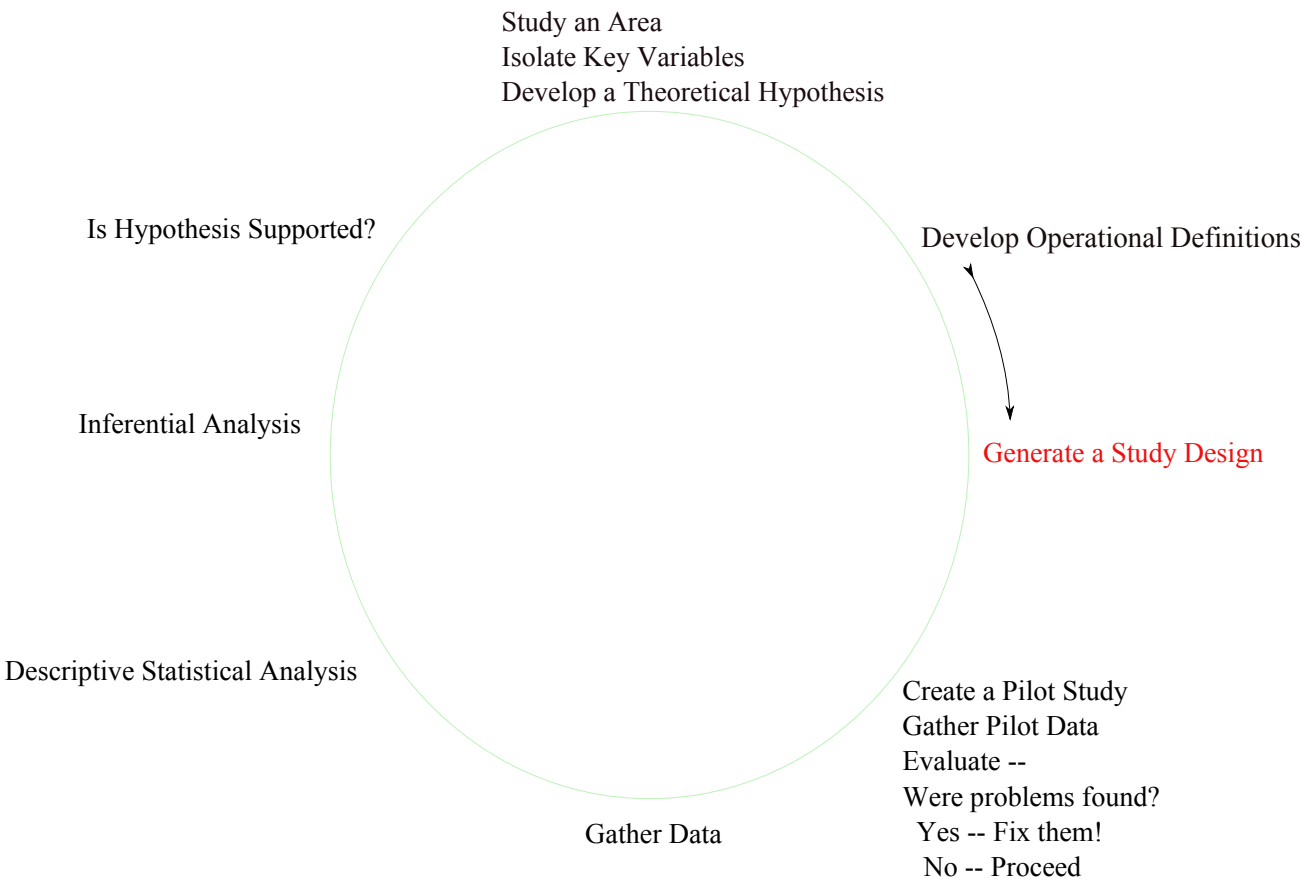

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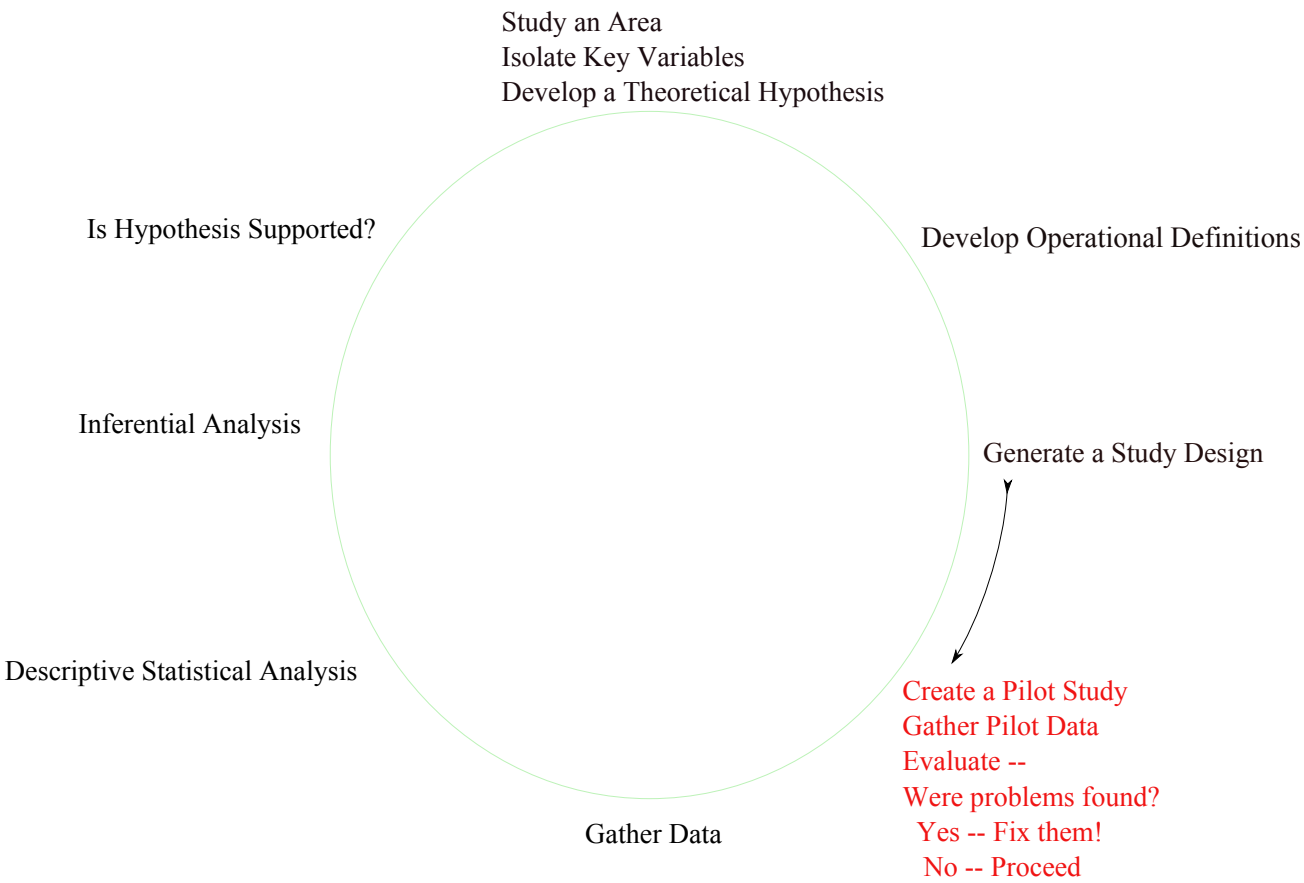

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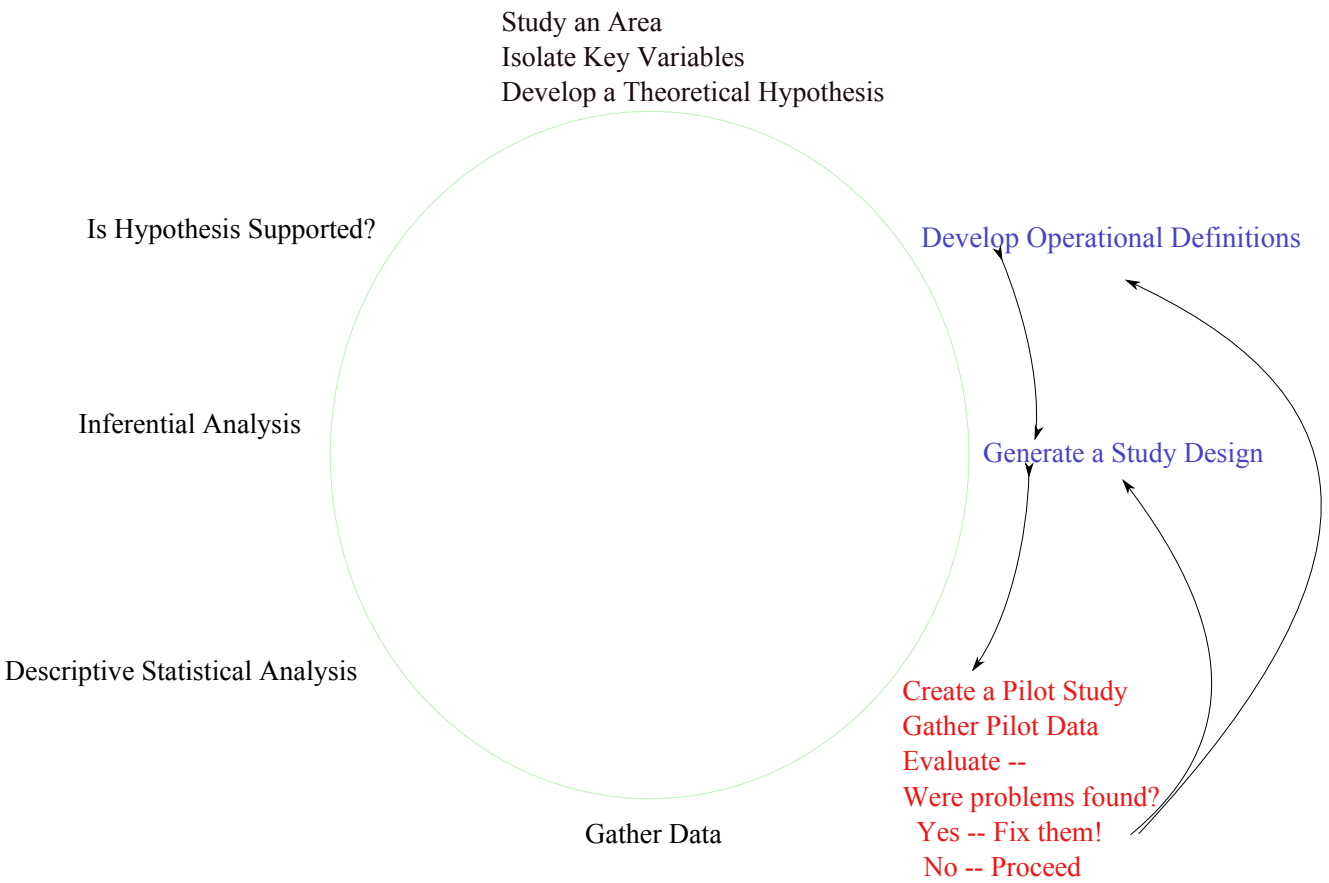

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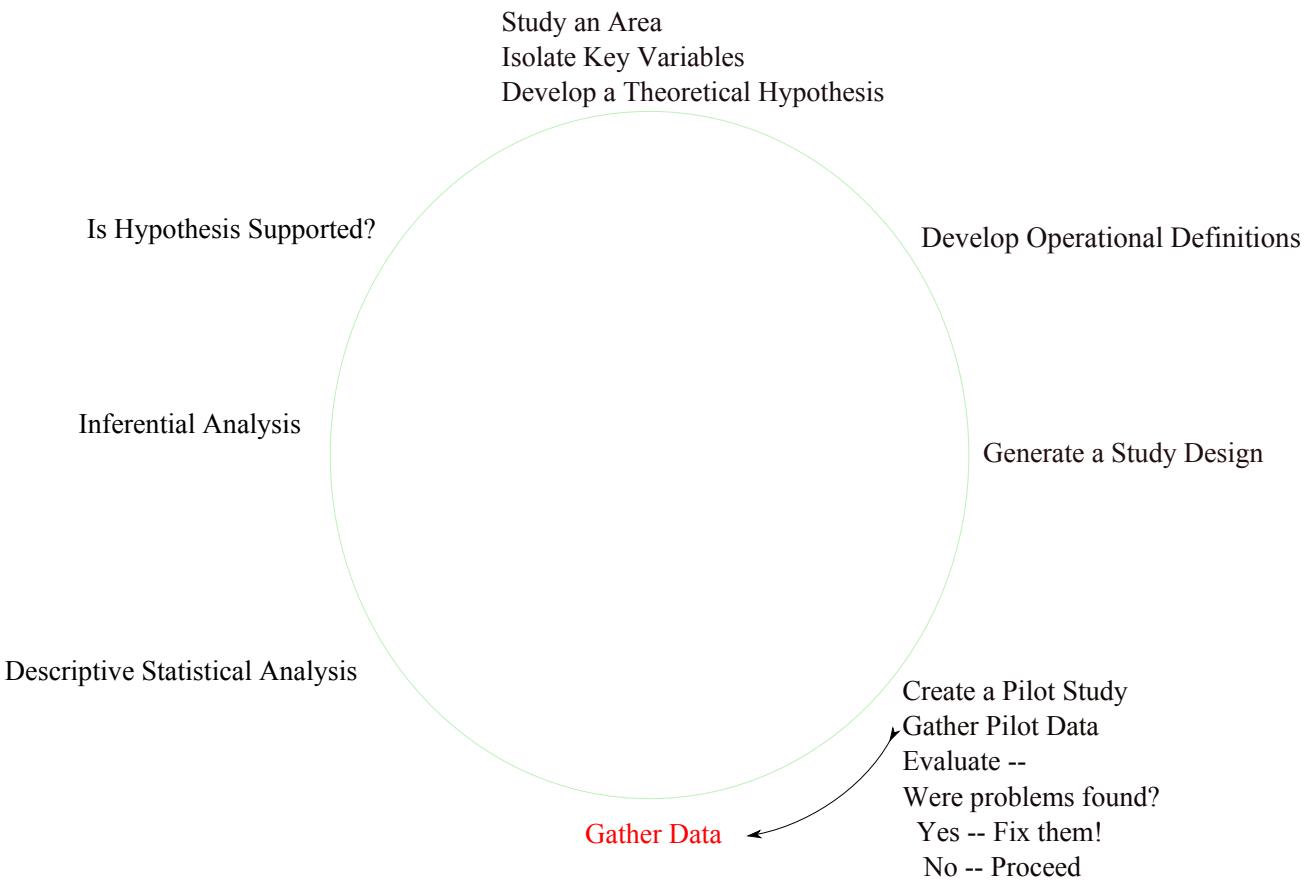

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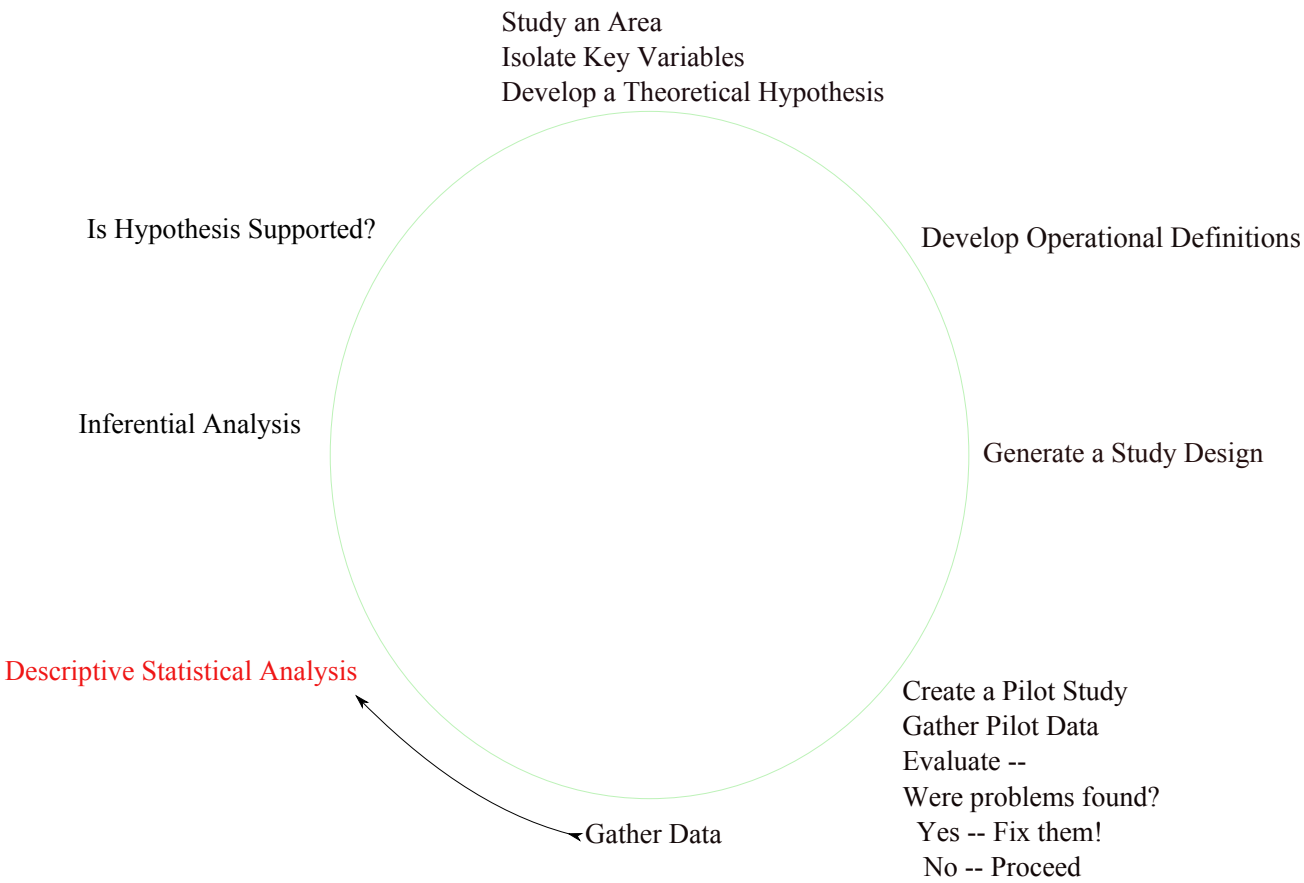

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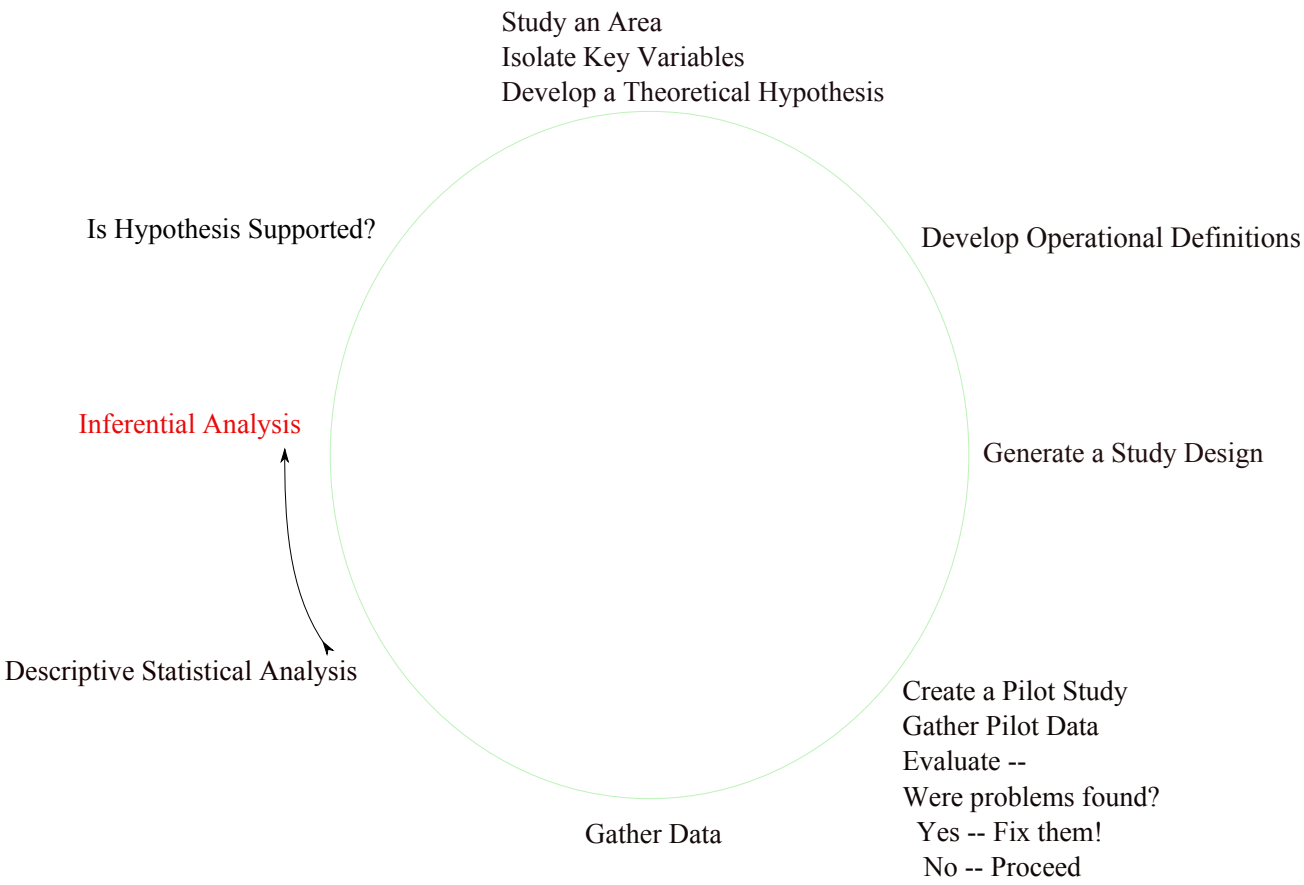

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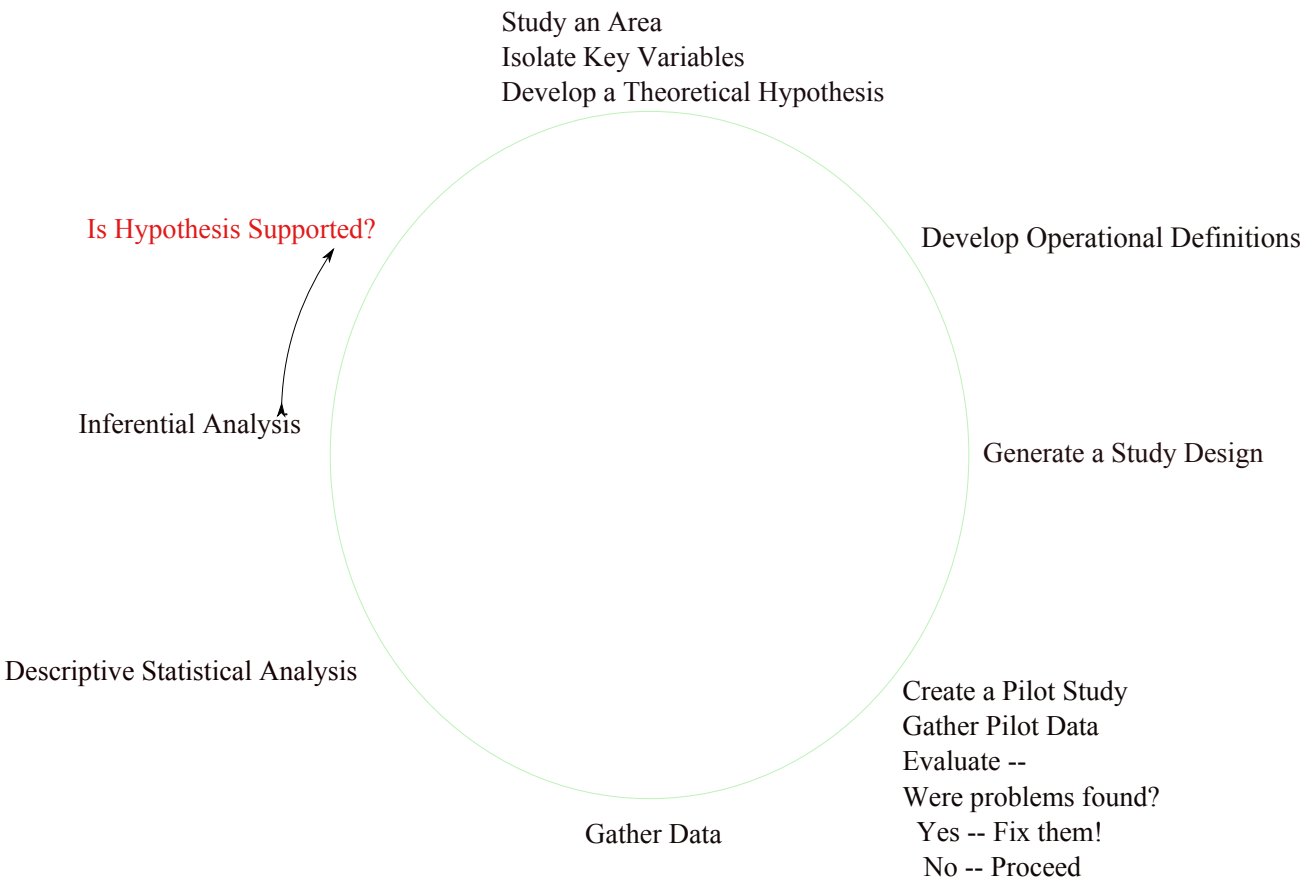

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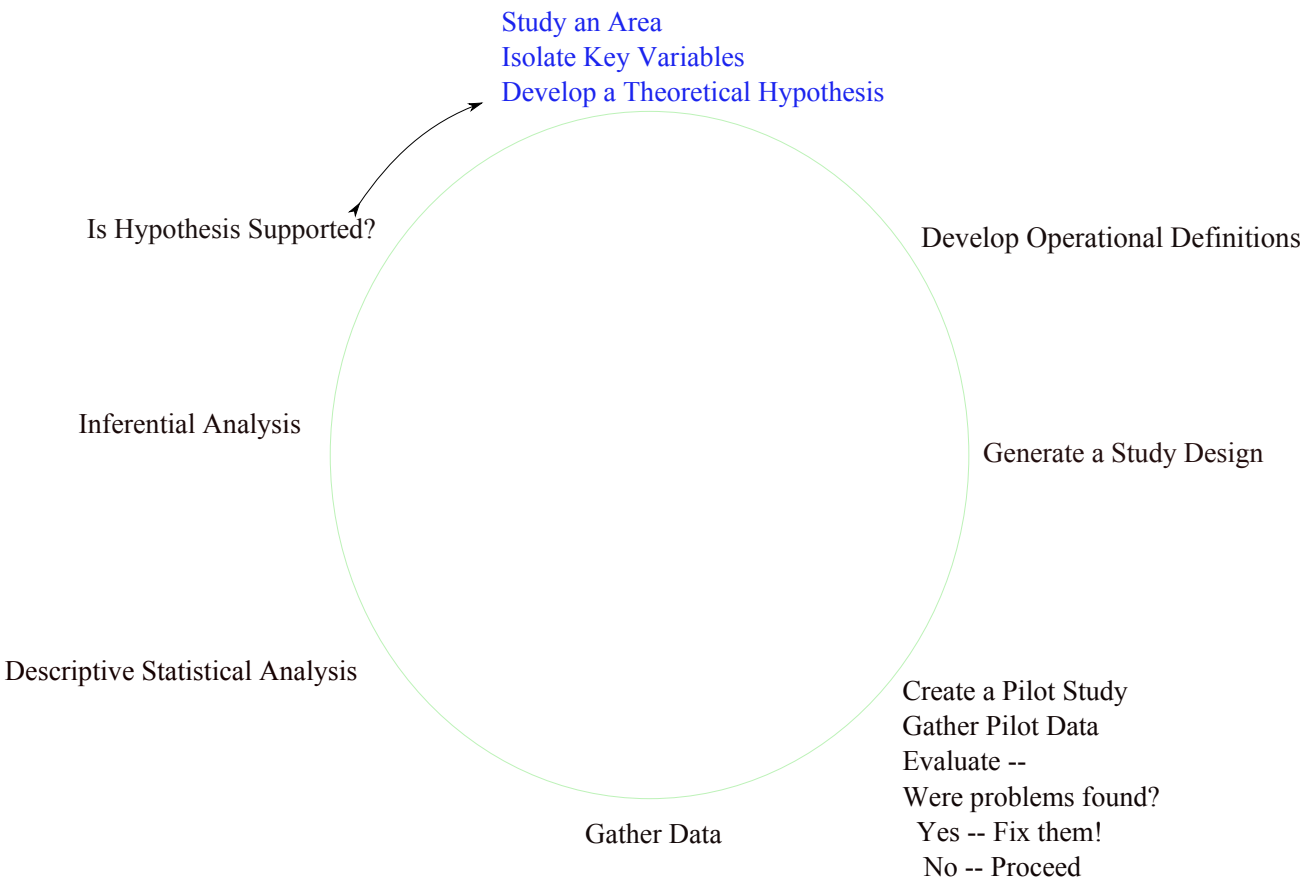

The Scientific Method