Which word(s) do you believe were most frequently used among the responses to the following question: *What do you expect to learn from this series of workshops*?

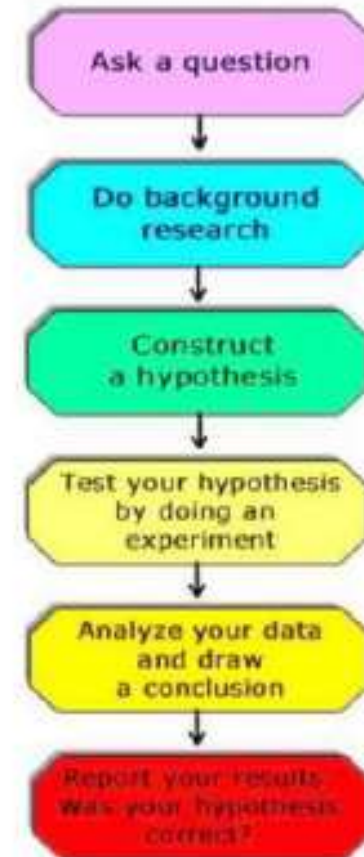# Doing Science : from Start to Finish (day 2)

Dr. Félix E. Rivera-Mariani

https://github.com/friveramariani/DoingScienceWorkshops

Today's goals

- Familiarize with the learning goals of this workshop series

- Understand and synthesize on the 1st phases of the scientific method

- Practice with the 1st phases of the scientific method

Our learning goals

- Understand the different parts of the "real" scientific method

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- Design **workable** goals through a scientific project

- Analyze the difference though processes towards a scientific goals

- Collect data in formats that are "easy" (or "less difficult") to analyze

- Answer questions related to our data-collection process

- Value the importance of team-work in the scientific process

- Understand, elaborate, and communicate with a scientific mindset

- *Design a rocket that will reach Jupiter and return to Earth within 6 days.*

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- *Determine the most frequent words students used in their responses about their workshop's expectations.*

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That's why the workshop is titled "Doing Science: From Start to Finish"

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```
##FastQC          0.11.4
>>Basic Statistics          pass
#Measure          Value
Filename          HISAT_SRR1554561.bam
File type          Conventional base calls
Encoding          Sanger / Illumina 1.9
Total Sequences 81348824
Sequences flagged as poor quality          0
Sequence length 100
%GC       52
>>END_MODULE
>>Per base sequence quality          pass
#Base    Mean      Median  Lower Quartile   Upper Quartile  10th Percentile 90th Percentile
1        31.94911166755158        33.0    31.0    34.0    30.0    34.0
2        32.093032912190594       34.0    31.0    34.0    30.0    34.0
3        30.917928057570936       34.0    31.0    34.0    27.0    34.0
4        34.95840799124521        37.0    35.0    37.0    32.0    37.0
5        35.39562039643007        37.0    35.0    37.0    32.0    37.0
6        35.460416022731934       37.0    35.0    37.0    33.0    37.0
7        35.45107785454895        37.0    35.0    37.0    33.0    37.0
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9        37.08720765281131        39.0    37.0    39.0    33.0    39.0
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12-13    37.08645650489059        39.0    37.0    39.0    33.0    39.0
14-15    38.411228323349825       40.0    38.0    41.0    33.0    41.0
16-17    38.34913744419956        40.0    38.0    41.0    33.0    41.0
18-19    38.29747088906903        40.0    38.0    41.0    33.0    41.0
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24-25    38.119847571490396       40.0    38.0    41.0    33.0    41.0
26-27    38.067842388231696       40.0    38.0    41.0    33.0    41.0
28-29    37.97659734454182        40.0    37.5    41.0    33.0    41.0
30-31    37.875907874421831       40.0    37.0    41.0    32.0    41.0
32-33    37.777807513234606       40.0    37.0    41.0    32.0    41.0
34-35    37.69257682815427        40.0    37.0    41.0    32.0    41.0
36-37    37.65264789199657        40.0    37.0    41.0    32.0    41.0
38-39    37.559309044221706       40.0    36.5    41.0    32.0    41.0
40-41    37.43140910064047        40.0    36.0    41.0    31.0    41.0
42-43    37.27508339272366        39.5    36.0    41.0    31.0    41.0
44-45    37.146250682124176       39.0    35.0    41.0    31.0    41.0
46-47    37.07137014666617        39.0    35.0    41.0    31.0    41.0
48-49    36.9389414959459         39.0    35.0    41.0    31.0    41.0
50-51    36.366193419096014       38.5    34.5    40.5    30.5    41.0
52-53    36.23450787684405        38.0    35.0    40.0    30.0    41.0
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http://wpsketchbook.blogspot.com/2011/10/eyes-forward-heads-down-its-test-time.html
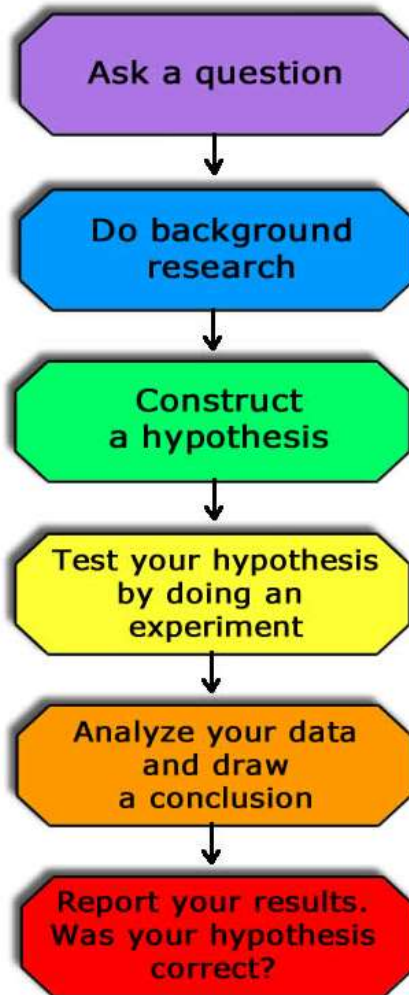
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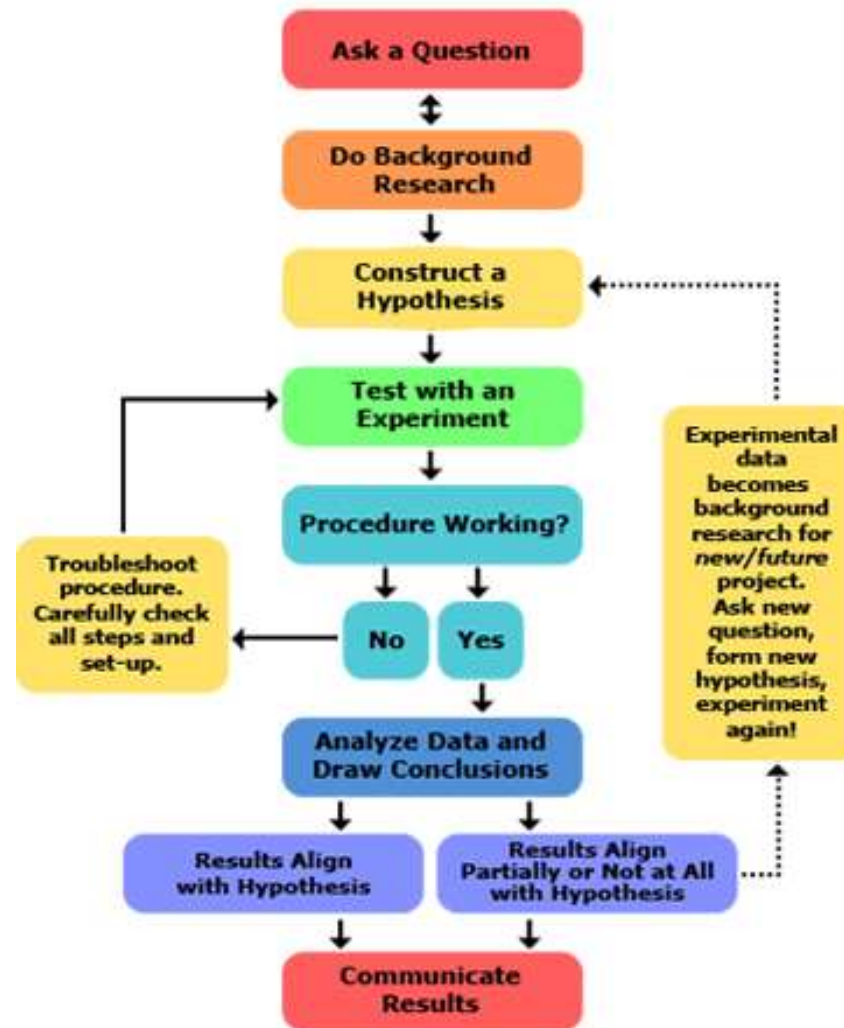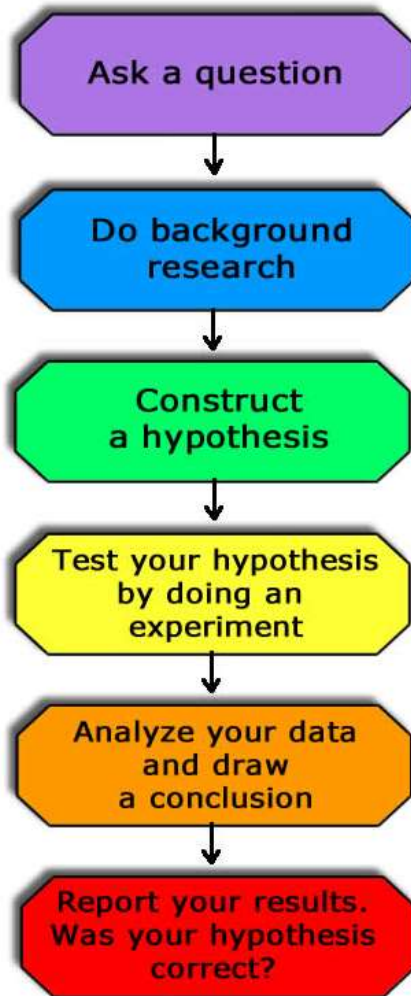- Understand, elaborate, and communicate with a scientific mindset

http://lifehacker.com/treat-failure-like-a-scientist-1537090657

The Scientific Method

The Scientific Method: *is this one correct?*

The Scientific Method: *what are the differences?*

Scientific Method

Ask a Question

Do Background Research

Construct a Hypothesis

The Scientific Method: *From Question to Hypothesis*

The Scientific Method: *purpose of the question*

Scientific Method

Ask a Question

The Scientific Method: *purpose of the question*

Scientific Method

Ask a Question

- Begins the thought process of the scientific method

- Helps think of the approach to use to answer the "problem"

The Scientific Method: *example of the question*

Scientific Method

Ask a Question

What are the most frequent words among the students' expectations of the workshop Doing Science?
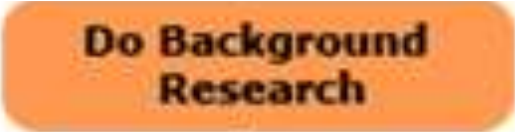
The Scientific Method: _features of the question_

What are the most frequent works among the students' expectations?

1) **Workable**
2) **Specific**

The Scientific Method: *why background research?*

Scientific Method

Do Background Research

The Scientific Method: *why background research?*

Scientific Method

Do Background Research

1) Has the question been answered by someone else?

2) Is the question feasible?

3) How have similar questions been answered?

Example: *background research and the question*

What are the <u>most frequent works</u> among the <u>students' expectations</u>?

1) Has the question been answered by someone else?

2) Is the question feasible?

3) How have similar questions been answered?

The Scientific Method: *function of the hypothesis*

Scientific Method

Construct a
Hypothesis

The Scientific Method: *function of the hypothesis*

Scientific Method

Construct a Hypothesis

1) **Educated guess…**

   a) **to guide the scientific discovery.**

   b) **because we know something about what we are trying to answer.**

The Scientific Method: *features of the hypothesis*

Scientific Method

1) Two important features of a hypothesis

Construct a Hypothesis

The Scientific Method: *features of the hypothesis*

Scientific Method

1) **Two important features of a hypothesis**

    a) **Testable**

    b) **Falsifiable**

Construct a Hypothesis

The Scientific Method: *features of the hypothesis*

Scientific Method

Construct a Hypothesis

1) **Two important features of a hypothesis**

   a) <u>**Testable**</u>**: be able to carry out experiments related to the hypothesis**

The Scientific Method: *features of the hypothesis*

Scientific Method

Construct a Hypothesis

1) **Two important features of a hypothesis**

   a) **Testable: be able to carry out experiments related to the hypothesis**

   b) **Falsifiable: be able to proven "true" or "false"**

Feature shared between the *question, background research, and hypothesis*

Must be specific

Example: *from question to hypothesis*

Example: *from question to hypothesis*

1) **What are the most frequent words among the students' expectations of the workshop Doing Science?**

Example: *from question to hypothesis*

Scientific Method

Ask a Question

Do Background Research

Construct a Hypothesis

2) **You submitted the expectations**

Example: *from question to hypothesis*

Scientific Method

- Ask a Question
- Do Background Research
- Construct a Hypothesis

3) ….

Homework: *what is the hypothesis?*

- Submit via email, at friveramariani@gmail.com, the hypothesis for the following question:

- What are the most frequent words to the students' expectations of the workshop "Doing Science"?