Introduction to Scientific Research

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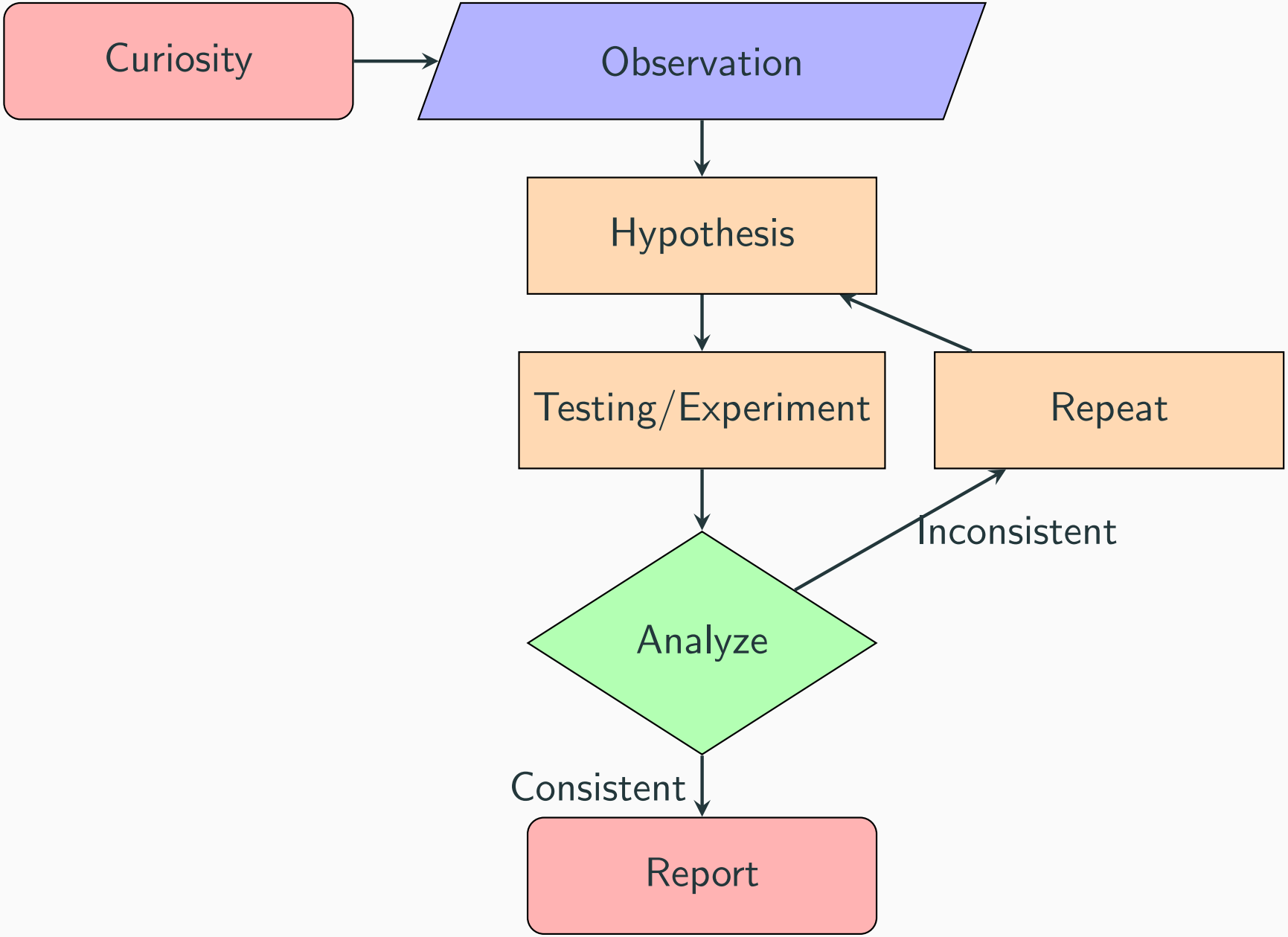
February 14, 2017

BISC 104
Session 1

Scientific research probes deepest mysteries of universe

The Process


Curiosity
Observation
Hypothesis
Testing/Experiment
Repeat
Inconsistent
Analyze
Consistent
Report

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- **Dependent variable**: Changes due to change in independent variable [Measured/Observed]
- **Control variable**: Could possible affect dependent variable, so should be kept constant

Planning an experiment

- Background Information

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- Sample Size

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- Statistical Analysis

Example: Baking bread

- **Hypothesis:** If amount of sugar increases, bread rises higher

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- **Control Variables**: Water, salt, temperature, brand of ingredients ... Should remain constant

Example: Baking bread

- **Hypothesis:** If amount of sugar increases, bread rises higher
- **Independent Variable**: Amount of sugar
- **Dependent Variable**: Size of loaf
- **Control Variables**: Water, salt, temperature, brand of ingredients
  ... Should remain constant

Amount of Sugar	Size of bread
10g	$600cm^2$
20g	$700cm^2$
25g	$710cm^2$
30g	$715cm^2$

Analysis Table

Sample Size?

Variability?

Example: Fertilizer and yield

- **Hypothesis:** Fertilizer X gives a better yield over fertilizer Y

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- **Hypothesis:** Fertilizer X gives a better yield over fertilizer *Y*
- **Independent Variable:** Amount of fertilizers X,Y
- **Dependent Variable:** Yield [kg/tonnes..]

Example: Fertilizer and yield

- **Hypothesis:** Fertilizer X gives a better yield over fertilizer Y
- **Independent Variable:** Amount of fertilizers X,Y
- **Dependent Variable:** Yield [kg/tonnes..]
- **Control Variables:** Watering frequency, temperature, weather conditions ....

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- All groups vote to select the best proposal
- Form groups of 2, decide a day/time to collect data
- Disperse!
- Carry out your experiments, analyze your results.

We will go over analysis part in next session. Please email your analysis report by next Tuesday 5PM.

Possible Analysis Table

Hypothesis: More females than males visit Sprinkles ATM

Time-Day	# Males	# Females
1215-1245–Th	..	..
1310-1340–W	..	..
Total	..	..

The bullet points in Section C.2 of the handout need to be answered in your report. Besides, few additional points that you may choose to highlight.

- Can you plot a trendline that gives you a better picture of how the numbers vary based on time
- Is it possible to explain the trend you see in the plots?

The above two points are not a requirement for the report.

Office Hours

Tuesday: 9-10AM

Wednesday: 9-10AM

ZSH 372

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Please don't forget to mail your analysis/report by 5PM, Tuesday(09/06).