

**Kitchen Science  
vs.  
Science Science**

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National Homebrewers Conference

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# “Kitchen Science”

Improper experimental design and/or mis-  
interpretation of results



Internet



**A LOT OF CRAPPY INFORMATION!!!**

# “Science Science”

- Scientific Method

- Question
- Background
- Hypothesis (not as important for homebrewing experiments)
- Experiment
- Interpret
- Share Results (peer-reviewed)

# Brewing Experiment Set-up

## Question

- What aspect of beer/brewing do you want to test?
  - Pick one (AND ONLY ONE) aspect of your beer/brewing you would like to investigate
  - Example: What aroma profiles do different hops contribute by dry-hopping (or more specifically how does the aroma profile of cascade compare to a newer variety like citra)?

# Brewing Experiment Set-up

## Background

- Do some research on your question or on the variable you are testing
  - Learn as much as you can about the variable you are testing (as well as the variables you are NOT testing)
  - Example: What hops are typically used for aroma, what beer style is best to test hop aroma, when to dry hop, for how long, at what temperature, etc

# Brewing Experiment Set-up

## Hypothesis

- What are your expectations?
  - What do you know and what don't you know and what do you expect
  - Example: Cascade has a flowery and citrusy aroma, while the citra aroma is described as fruity

# Brewing Experiment Set-up

## Experiment

- What experiment can you set up to test your hypothesis?
  - Set up a brewing session to test your hypothesis where you keep everything CONSTANT except for what you are testing (don't forget controls!)
  - Example: Brew an American Pale Ale, split the batch into three secondary fermentors and dry-hop one with cascade (positive control), one with citra (unknown) and one with no dry hops (negative control)

# Brewing Experiment Set-up

## Interpret

- Evaluate your experiment
  - Sample\* your beers and test your hypothesis -> ie were your expectations correct or incorrect?
  - Example: Taste your three beers, taking note of the different aromas in each beer (use the non dry-hopped beer as a reference to determine which aromas are common to all beers and which are characteristic to cascade/citra)

# Brewing Experiment Set-up

## Share Results

- Share your knowledge
  - Share your findings with homebrew friends, your homebrew club or post your results online (include your experimental design)
  - Example: share your tasting notes, specifically aroma descriptors but also any potential flaws in your design or implementation so people can draw their own conclusions

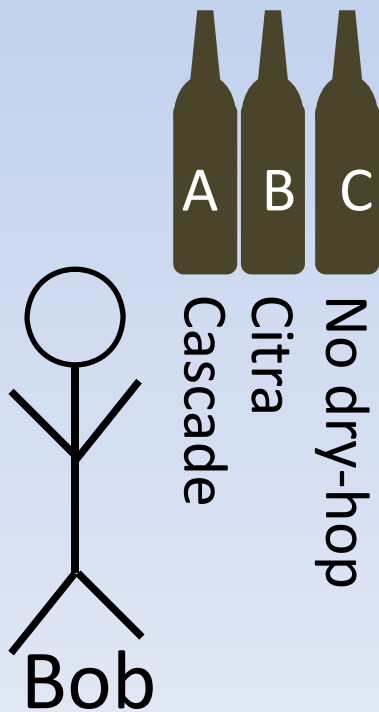
# Evaluation

(Sampling your beer)

- Most important part!!!!
  - If at all possible, use double blind procedure to ensure impartiality
  - In other words, neither the evaluator nor the experimenter should know the identity of each beer
  - All homebrew competitions are set up this way

# Evaluation

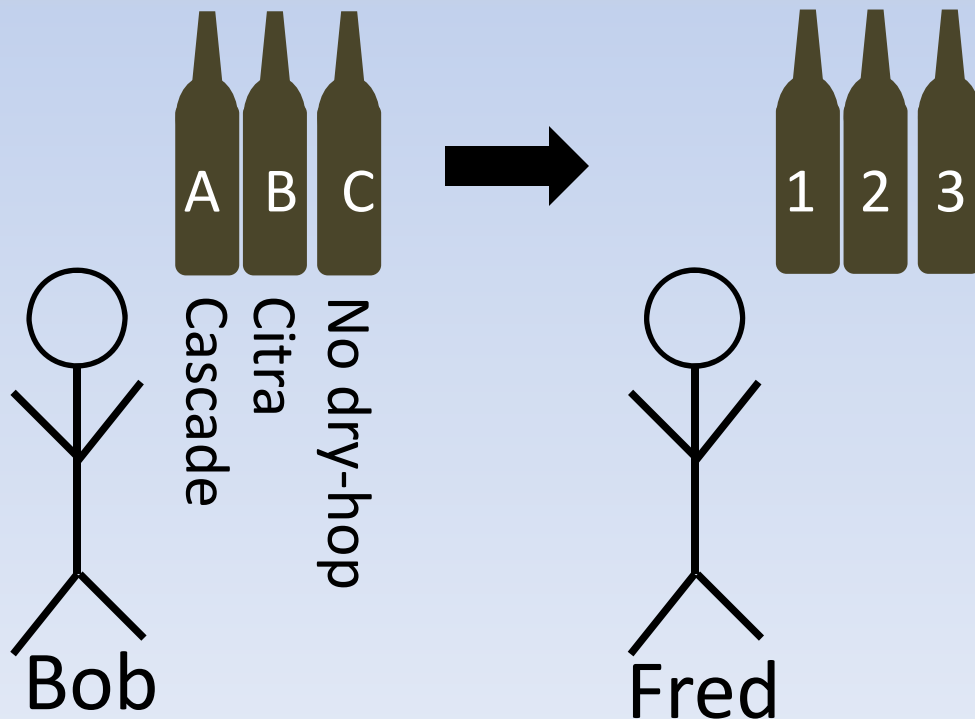
- Double-Blind Example (ie how a competition is organized)



Bob labels each beer with "A", "B", "C", etc and records the identity of each beer

# Evaluation

- Double-Blind Example

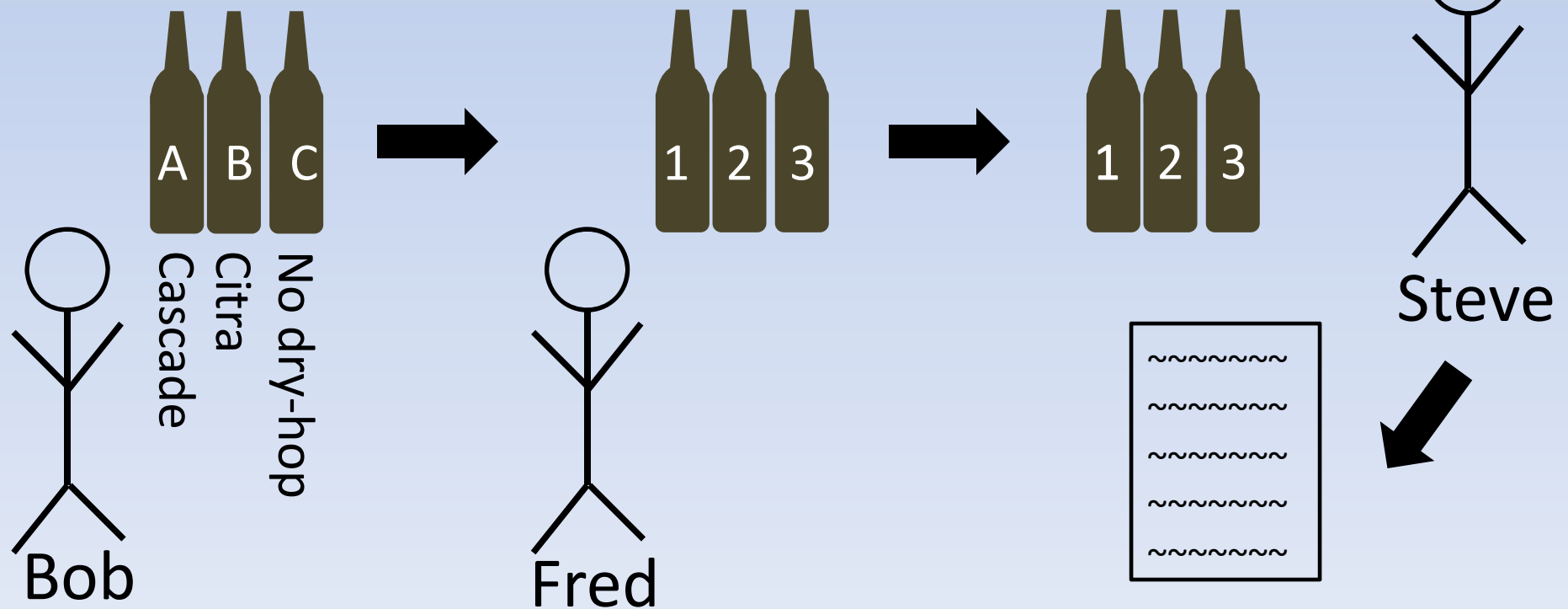


Bob gives the bottles to Fred, who only sees the "A", "B", "C" labels, but does not know what beer is what. Fred assigns them a number a records A=1, B=2, C=3, etc and removes the "A", "B" and "C" labels.

# Evaluation

- Double-Blind Example

Fred gives the bottles to Steve (ie the judge) and Steve evaluates the beers. After evaluation is complete, Fred and Bob compare their lists to properly match the score sheet with the correct beer.



# Final Remarks

“K.I.S.S” - Keep it simple stupid

- Only change ONE variable at a time
- Do your research
- Get help (brewing, evaluating, etc)
- Have multiple evaluators
- Remove bias

# Brewing Experiment

- Dry-Hop experiment
  - APA, 35 IBUs, Y1056 fermented in bulk, OG: 1.048
  - Split into 6, 5 receiving 1.5 oz of a different hop for dry hopping, 1 not receiving any dry hops (control)
- Sugar experiment
  - Same base beer as above, diluted to 1.042
  - Different sugars (syrup) added at high krausen (15% of fermentables) OG back up to 1.048
  - Control received no sugar and was not diluted

# Sample beer

- Sample each beer, take (mental) notes
- The identity of each beer will be revealed at the end

# Results

- Dry Hops

- A: Control
- B: Citra
- C: Cascade
- D: Polish Marynka
- E: Hersbrucker
- F: Fuggle

- Sugar

- 1: Treacle
- 2: Lyles Golden Syrup
- 3: Sugar in the Raw
- 4: Brown Sugar
- 5: Invert No.1
- 6: Invert No.3
- 7: Invert No.2
- 8: White Sugar

Thanks to...

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**NORTHERN BREWER** HOMEBREW SUPPLY

for donating ingredients