Designing experiments

A practice using superstitions

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Instructions

You will work in groups to design an experiment. The number of groups should be at least four, and even.

The exercise has four stages:

1. design of an experiment
2. peer review after swapping papers between groups
3. answers to reviewers
4. grading (by teacher)

As the exercise will be graded, make sure that all papers include the full names of the students in the group. Do return the papers at the end of the class.

Superstitions (choose one)

1. An apple a day keeps the doctor away.
2. Eating chocolate causes zits (finni).
3. Shaving your legs makes the hair grow back more densely.
4. Drinking coffee will stunt a child's growth.
5. If you swim right after eating, you will get cramps.
6. If you go outside when your head is wet, you'll catch a cold.
7. A red ribbon placed on a child who has been sick will keep the illness from returning.
8. A half onion placed under the bed of a sick person will reduce the fever.
9. Break a mirror and you will have seven years of bad luck.
10. If you blow out all the candles on your birthday cake with the first puff you will get your wish.

Design round (15 minutes)

Your design can be in the form of a list or written description, but it must be readable enough that others can evaluate it. Include all the following elements in as much detail as possible:

- hypothesis to be tested
- experimental units
- independent variable(s)
- control
- response variable(s) and how you'll measure it/them
- the most important background variables to control
- replication (sample size)

Peer Review round (10 min)

Consider both major flaws and weaknesses of the proposed experiment. Distinguish between what you consider that *must* be changed to make the experiment valid, and what *could* be chnaged to improve its reliability or improve efficiency (decrease the amount of work or cost).

- Does it adequately test the stated hypothesis?
- Are the variables (independent, response, and controlled) and control appropriate and described in sufficient detail?
- Is the sample size sufficient?
- For each of these questions justify your answer.
- What improvements to the design can you suggest?

Response round (10 min)

Consider:

- Are the criticisms due an actual problem, or a missunderstanding due to a poor description of the design.
- Are the flaws described in the peer review real?
- Are the solutions suggested by the reviewers good? or can you suggest a better alternative?
- Are the suggested improvements applicable? do they increase the need for resources?
- Consider alternative solutions to the problems found by reviewers, and if better, then include them in your answer.

References

Hoefnagels, Mariëlle H.; Rippel, Scott A. (2003) “Using Superstitions & Sayings To Teach Experimental Design in Beginning & Advanced Biology Classes”, The American Biology Teacher 65(4):263-268. 2003, (https://doi.org/10.1662/0002-7685(2003)065%5B0263:USSTTE%5D2.0.CO;2)