Classroom Response Systems at Duke

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Statistical Science
Psychology and Neuroscience

What is enthalpy?
Text a CODE to 37607
Submit a CODE to http://pollev.com

reaction that releases heat
reaction that absorbs heat
the total energy of a system
Sta 101
100 - 120 students
i>clicker2
- multiple choice & numerical answer questions (participation)
- readiness assessments (accuracy)
- data collection
look familiar?
engaging lectures

“I like [the clicker questions] – they keep your mind from wandering too far off during lecture.”

active learning

“[… ] clicker questions really do force you to work and understand what is going on.”

peer instruction

“I like […] the opportunity to discuss the answers with our classmates after submitting the answers.”

immediate feedback

 “[the clicker questions] enable us to see where were at/figure out if we need to study or work harder to catch up.”

anonymous participation

“[I like being] able to participate without other people seeing what I answered.”
Clicker question

Which of the following is the correct set of hypotheses for testing if the proportion of all Duke students who would be bothered a great deal by the melting of the northern ice cap differs from the proportion of all Americans who do?

(a) \( H_0 : p_{\text{Duke}} = p_{\text{US}} \)
   \( H_A : p_{\text{Duke}} \neq p_{\text{US}} \)

(b) \( H_0 : \hat{p}_{\text{Duke}} = \hat{p}_{\text{US}} \)
   \( H_A : \hat{p}_{\text{Duke}} \neq \hat{p}_{\text{US}} \)

(c) \( H_0 : p_{\text{Duke}} - p_{\text{US}} = 0 \)
   \( H_A : p_{\text{Duke}} - p_{\text{US}} \neq 0 \)

(d) \( H_0 : p_{\text{Duke}} = p_{\text{US}} \)
   \( H_A : p_{\text{Duke}} < p_{\text{US}} \)

Both (a) and (c) are correct.
Clicker question
Which of the following is true?

(a) If the sample size is large enough, conclusions can be generalized to the population.
(b) If subjects are randomly assigned to treatments, conclusions can be generalized to the population.
(c) Blocking in experiments serves a similar purpose as stratifying in observational studies.
(d) Representative samples allow us to make causal conclusions.
(e) Statistical inference requires normal distribution of the response variable.
Sta 101: Data Analysis and Statistical Inference

Dr. Çetinkaya-Rundel

Unit 2

Readiness Assessment

1. Which of the following states that the proportion of occurrences with a particular outcome converges to the probability of that outcome?
   - (a) Bayes' theorem
   - (b) General addition rule
   - (c) Law of large numbers
   - (d) Law of averages

2. Shown below are four Venn diagrams. In which of the diagrams does the shaded area represent A and B but not C?
   - (a) 
   - (b) 
   - (c) 
   - (d) 

3. Which of the following is false about probability distributions?
   - (a) Each probability should be greater than or equal to 0.
   - (b) The outcomes listed must be independent.
   - (c) Each probability should be less than or equal to 1.
   - (d) The probabilities must total 1.

4. Last semester, out of 170 students taking Sta 101, 71 students were social sciences majors (primary major), 53 students were premed, and 6 were both premed and social sciences majors. What is the probability that a randomly chosen student is premed, given that s/he is a social sciences major?
   - (a) \( \frac{6}{77} \)
   - (b) \( \frac{57}{170} \)
   - (c) \( \frac{57}{176} \)
   - (d) \( \frac{6}{170} \)

5. Which of the following is false?
   - (a) If two events (both with probability greater than 0) are mutually exclusive, they could be independent.
   - (b) When computing the probability that a card drawn randomly from a standard deck is either a Jack or a 4, you can use the addition rule.
   - (c) If two events (both with probability greater than 0) are mutually exclusive, they are not necessarily complements.
   - (d) If the probabilities of two events add up to 1, they are complements.
Case study: Gender discrimination

Simulation setup

<table>
<thead>
<tr>
<th>Gender</th>
<th>Promoted</th>
<th>Not Promoted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>21</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>13</td>
<td>48</td>
</tr>
</tbody>
</table>

% of males promoted: \( \frac{21}{24} = 0.875 \)

% of females promoted: \( \frac{14}{24} = 0.583 \)

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Statistics 101 (Mine Çetinkaya-Rundel)  
U1 - L3: Inference via simulation  
January 22, 2013  
13 / 17

source: Google images
PROs:
- easily track student responses for grading (compatible with Sakai roster)
- self paced polling
- no internet access on gadget

CONs:
- “I forgot my clicker”
- numeric response capabilities not great
- hefty price for item that has no other use
**best practices**

**grading**
- participation only, not for accuracy
- 5% - 10% of overall grade
- automatically drop few days of absences/forgot clickers/etc.

**peer instruction**
- spend time going over the question, even if on the second try majority of the students got it right

**cost**
- Google Doc where outgoing students can leave their information if they want to resell their clickers the following semester