The Citadel Mission Statement

...The Citadel strives to produce graduates who... are capable of both critical and creative thinking, have effective communication skills, can apply abstract concepts to concrete situations, and possess the methodological skills needed to gather and analyze information...
Definition

“Critical thinking is... reasonable reflective thinking focused on deciding what to believe or do.”

Robert H. Ennis,
Director, Illinois Critical Thinking Project
University of Illinois at Urbana Champaign
Case Studies in Science
http://library.buffalo.edu/libraries/projects/cases/case.html

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Case Study Teaching in Science

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Editorial Board

Search the site for:  
Match:   ○ Any word   ○ All words (use quotes for exact phrase)
Case Study Ideas
• Discuss outcomes with instructor
• Pay attention to content scaffolding
• Choose relevant case study
• Adapt case as needed
• Focus on discipline-specific literature
• Write questions
Discipline-specific instruction

BIOL 310   CIVL 208
CSCI 103   CSCI 654
PSYC 410
BIOL 310
An End to Ulcers?

BIOL310
October 22, 2009
adapted by
MAJ Elizabeth Connor
from A Case Study in the Scientific Method by Kristi Hannam, State University of New York - Geneseo and Rod Hagley, University of North Carolina - Wilmington
What do you think causes ulcers?

A. Stress.
B. Excessive stomach acids.
C. Bacteria.
D. A bad diet and alcohol use.
E. Being overweight.
History of the understanding of stomach function & ailments

HIPPOCRATES

This engraving represents the appearance of the aperture with the valve depressed.

A A A Edges of the aperture through the integuments and intercostals, on the inside and around which is the union of the lacerated edges of the perforated coats of the stomach with the intercostals and skin.

B The cavity of the stomach, when the valve is depressed.

C Valve, depressed within the cavity of the stomach.

E E E F Cicatrice of the original wound.

F The nipple.

WILLIAM BEAUMONT
What Causes Ulcers?
Which is a good way to test the belief that “excess acid” causes ulcers?

A. Examine ulcer patients of a range of ages and measure their stomach acid levels.
B. Have volunteers drink alcohol and measure their stomach acid levels.
C. Lower stomach acid levels of some volunteers (using drugs/antacids), and measure numbers of ulcers in all volunteers.
D. Examine patients of a range of ages and measure the number of ulcers in each person.
E. Put volunteers through a stress test and then measure their stomach acid levels.
What step in the scientific method does this test represent?

A. Making observations.
B. Developing a hypothesis.
C. Determining predictions.
D. Testing a hypothesis.
E. Assessing support for a hypothesis.
A Possible Study Design

- Doctors divide patients into two groups:
  
  Group 1 received antacids and were instructed to take them 3x/day
  Group 2 received sugar pills and were instructed to take them 3x/day

- After 3 months, the number of ulcers per patient is assessed.

- Predict what the results would look like if the excess acid theory was supported.
Draw this graph: Predict what the results would look like if the “excess acid theory” was supported by the results of this study:

# Ulcers/patient

Group 1  Group 2
Treatment Group
Which graph most closely matches the results you predicted?

A

B

C

D

Which graph most closely matches the results you predicted?
Unfortunately, this type of controlled experiment was NOT conducted.

BUT, patients who took antacids had decreased ulcer symptoms.

If the patients stopped taking the antacids their ulcers returned.

Image by: Midnightcomm
Dr. J. Robin Warren: (pathologist)

Examines stomach biopsies of patients with various stomach ailments.
The slides that Dr. Warren examined had smudges that were not clearly visible under low power, so he attached a high-power lens to his microscope. What do you think he was able to see then?

A. Many cells at once.
B. Only one cell at a time.
C. Organelles within the cells.
D. Bacteria.
E. Viruses.
Dr. Warren thought he saw:

- *Helicobacter pylori* (a new species of bacteria)

- But no one else believed him!

The black squiggly spots on the slide are bacteria that Dr. Warren observed in his biopsy slides.
Dr. Warren’s colleagues did not believe there were bacteria in the stomach. Why do you think other pathologists did not believe bacteria were in the stomach biopsies?

A. Bacteria are never found inside the human body.
B. The pH of the stomach is too acidic for any bacteria to survive.
C. No one else had reported seeing bacteria in their biopsy samples.
D. Ulcers and stomach cancer are caused by age, stress and diet – bacteria have nothing to do with the problems the patients came to the hospital for.
So, Dr. Warren:

- Used a special stain that highlights bacteria on his slides.
- This convinced his colleagues that the bacteria were there.
Dr. Barry J. Marshall Joins Dr. Warren’s Research

- Hypothesis: Bacteria CAUSE stomach ulcers.

- If you were working with Drs. Warren & Marshall to design a study to determine whether the bacteria caused ulcers, how would you do it?
Their First Survey Study:

- 100 stomach ulcer patients surveyed (biopsy taken).
- 100% had *H. pylori* present.
The doctors treated ulcer patients with antibiotics to see if the disease stopped. What is missing from their study?

A. An experimental treatment.
B. A control group.
C. An independent variable.
D. A dependent variable.
E. A hypothesis.
Important Aspects of Experimental Design

- Testable hypothesis, i.e., a way to measure a response and a way to divide groups up into:
  - Control and Treatment Groups
    - Control is the group that does not get the hypothesized treatment.
    - Treatment is the group that does get the hypothesized treatment.
Finding the studies


**Unidentified curved bacilli in the stomach of patients with gastritis and peptic ulceration.**

**Marshall BJ, Warren JR.**

Biopsy specimens were taken from intact areas of antral mucosa in 100 consecutive consenting patients presenting for gastroscopy. Spiral or curved bacilli were demonstrated in specimens from 58 patients. Bacilli cultured from 11 of these biopsies were gram-negative, flagellate, and microaerophilic and appeared to be a new species related to the genus Campylobacter. The bacteria were present in almost all patients with active chronic gastritis, duodenal ulcer, or gastric ulcer and thus may be an important factor in the aetiology of these diseases.
Rapid urease test in the management of Campylobacter pyloridis-associated gastritis.

Peptic ulcer: an infectious disease?

The translation of Helicobacter pylori basic research to patient care.
Drs. Warren & Marshall win the 2005 Nobel Prize in Medicine & Physiology

The Nobel Prize committee recognized Warren & Marshall’s work changed peptic ulcers from one of the world’s most common chronic, debilitating diseases to one easily cured with a simple drug regimen.

Opened new avenues of research - microbial causes of other chronic inflammatory diseases.

Also increased understanding of links between chronic infection, inflammation, and cancer.
If your father was diagnosed with stomach ulcers, what do you think the recommended treatment would be?

A. Lower stress levels.
B. Change diet to eliminate spicy food.
C. Take a course of antibiotics.
D. Drink milk to lower stomach acid levels.
E. Lose weight and exercise.
Faced with finding more information on the subject of gastric diseases caused by this organism, which resource would you choose?

A. MEDLINE.
B. Wikipedia.
C. Google Scholar.
D. CDC Web site.
E. Gastroenterology textbook.
ulcer or gastritis or gastric or gastrointestinal or stomach

X

campylobacter or helicobacter
Are you familiar with snowboarding?

A. Yes, as a spectator.
B. Yes, as a participant.
C. Yes, as a spectator and a participant.
D. No, I enjoy other winter sports.
E. No, I live in the south!
F. Other.
Snowboarding in New York State:
A GIS Case Study

by
Jeffrey C. Brunskill and Christopher A. Badurek
Department of Geography
University at Buffalo, State University of New York
• Read case aloud, taking turns, paragraph by paragraph.
• Skim the two articles and refer to other handouts (on your table).
• Use clickers to answer questions.
• Use a scholarly database to find more information.
• Develop criteria for selecting the optimal resort.
• Consult URLs on handout to research each resort.
• Use http://epodunk.com and http://www.snow-forecast.com/ to research the specific resort towns.
• Rank the sites based on these criteria.
• Defend your rankings.
http://epodunk.com/

SEARCH

State: <All>  
Place type: Communities  
Search for: hillsdale  
Search Type:  
- Place names only  
- Place names, plus former names  
- Origin of place name only (surname search)

Search results (1)

<table>
<thead>
<tr>
<th>Communities</th>
<th>Former names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillsdale (town), Columbia County, NY</td>
<td>Nobletown</td>
</tr>
</tbody>
</table>
Vote for Optimal Resort

A. Catamount Ski Area
B. Gore Mountain
C. Hickory Ski Area
D. Holiday Valley
E. HoliMont Ski Resort
F. Hunter Mountain Snow Ski resort
G. Kissing Bridge
H. Windham Mountain
From the following list, choose the MOST scholarly source:


Use Scholarly Resources

- Find more information about the use of GIS to make business/engineering decisions related to adding snowboarding activities to an existing resort.
- Use Academic Search Premier, ScienceDirect, Wiley InterScience, CrossRef or another resource listed on the handout.
- Report back.
Think, Pair, Share
THANKS

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