Critical Thinking Workshop

The Amazing Meeting 5
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presented by

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Website
http://skepdic.com/ct/

Presenters

Diane Swanson: practical exercises to get kids to think critically

Diane has researched and written 66 books, about 400 magazine articles, and many booklets, newsletters, manuals, and video scripts for corporations and government departments. She's a contributing editor to *YES Mag: The Science Magazine For Adventurous Minds* and a regular contributor to *KNOW: The Science Magazine for Curious Kids*.

She's made presentations about nature, science, and writing in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, New Brunswick, Northwest Territories, Washington, California, Nevada, and Pennsylvania, at schools, libraries, universities, book festivals, conferences, literature roundtables, and public events, as well as on radio and television.

Dr. Robert T. Carroll: meanings and methods of teaching critical thinking

Bob is a professor of philosophy at Sacramento City College and is the author of *The Skeptic's Dictionary* and *Becoming a Critical Thinker*. He's been teaching critical thinking classes of one form or another since 1974. He'll share his hopes and frustrations of more than 30 years of trying a variety of courses and exercises to bring critical thinking into the classroom.

Dr. Ray E. Hall: classroom activities for fooling students into not fooling themselves

Ray is a physicist from California State University at Fresno. He works in the field of experimental particle physics and was part of the team that discovered the top quark. He's compiled and designed a number of interactive classroom demonstrations that challenge students to reassess how much to trust their own perception and show known limits on cognition. The hope is that if students can be brought to terms with their own inherent limitations that they will be more receptive to acquiring the tools of critical thinking.

Critical Thinking and the Critical Thinker

Critical thinking: thinking that is clear, accurate, knowledgeable, reflective, and fair in deciding what to believe or do.

(For a more detailed definition (650 words): http://www.criticalthinking.org/aboutCT/definingCT.shtml)

The Critical Thinker

1. **Attitude/disposition**: **openminded; skeptical; fairminded; tentative**

    - **Intellectual humility**: a willingness to admit error, change beliefs when warranted, or suspend judgment
    - **Confidence in reason**: a willingness to go wherever the evidence leads
    - **Intellectual curiosity**: a love of exploring new topics, learning new things, gaining knowledge
    - **Intellectual independence**: a willingness to examine honestly and fairly the positions of those you disagree with; and a willingness to question authority, tradition, and majority opinion

The critical thinking attitude is unnatural and must be cultivated. To understand this requires a few insights into how we acquire beliefs and make decisions

2. **Insights**

    - a recognition of tendencies to **perceptual and cognitive biases** and how they affect interpretations of experience, testimony, and other evidence

        i. Sense perception, memory, worldviews
        ii. Apophenia, ideomotor effect, inattentional blindness, magical thinking, pareidolia, selective thinking
        iii. confirmation bias
        iv. self-deception and wishful thinking; egocentrism; worldview assumptions, biases, and prejudices
        v. communal reinforcement, ethnocentrism
        vi. law of truly large numbers (coincidences)

    - a recognition that there are **alternative explanations** for experiences and that selecting from among them requires consideration of the consequences and implications of the alternative explanations as well as an awareness of the assumptions they are built on

Critical Thinking

3. Standards

- Clarity
- Accuracy
- Relevance
- Completeness
- Significance
- Fairness
- Sufficiency of evidence
- Consilience
- Logic: coherence, contradiction, and validity

4. Skills

- Abuses of language: doublespeak; understanding vagueness, ambiguity, obscurity; effective use of definitions
- Recognizing assumptions and implications
- Evaluating sources of information
- Evaluating claims and arguments
- Common fallacies: of assumption, of relevance, of omission, of insufficient evidence
- Evaluating inductive reasoning: simple induction (sampling) and analogical reasoning
- Evaluating explanations and causal reasoning
- Evaluating scientific and conceptual theories
- Applying the hypothetico-deductive model and argument to the best explanation

Causal reasoning exercise

Case 1. Phineas Gage's moral character changed dramatically after an explosion blew a tamping iron through his head (Damasio). Gage was leading a railroad construction crew near Cavendish, Vermont, when the accident occurred. "Before the accident he had been a most capable and efficient foreman, one with a well-balanced mind, and who was looked on as a shrewd smart business man." After the accident, he became "fitful, irreverent, and grossly profane, showing little deference for his fellows. He was also impatient and obstinate, yet capricious and vacillating, unable to settle on any of the plans he devised for future action." [Any causal implications?]

Case 2. When Ann Dey's dog had a stroke in July, one side of his face became paralyzed so severely he couldn't blink. She knew she needed to do something before the 13-year-old pug, Jimmy, lost his eye to infection.

"I was open to anything that would help," Dey said.

At Pets Unlimited, a nonprofit animal hospital that was San Francisco's first all-holistic veterinary medical clinic on Monday, Jimmy received acupuncture for a month. Now, his face is fine. [What causal claim is being suggested?]

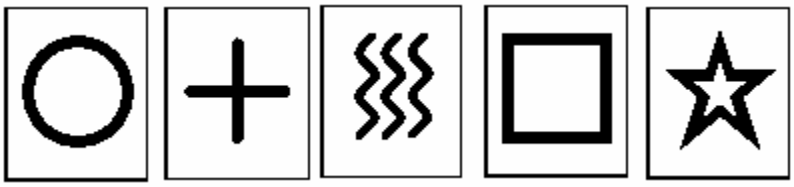
Case 3. A man with obsessive compulsive disorder tries to kill himself because he can no longer live with the disorder. He shoots himself in the head, damaging part of his brain, but survives and no longer has obsessive compulsions. [Causal implications?]

Case 4. Mary buys a magnetic bracelet to relieve her arthritic pain. She says that almost immediately upon wearing the bracelet her pain was significantly reduced and recommends the bracelet to others with pain. [What causal claim is being suggested?]

Question: each case involves a single case of one thing happening after another. Why do we treat cases 2 and 4 as post hoc fallacies, but not cases 1 and 3? (Hint: the answer has to do with background knowledge and the availability of reasonable alternative hypotheses.)

ESP test using Zener cards (modified replication of J. B. Rhine's experiments)
Joseph Banks Rhine (1895-1980)

Zener cards: one deck consists of 25 cards, 5 of each of the following



General description of the experiment:

The tests involve a sender and a receiver. The sender concentrates on the selected card while the receiver concentrates on trying to get information from the sender's mind (telepathy) or from the card itself (clairvoyance).

Things to consider:

1. physical layout
2. method of selecting cards to send, including randomization procedures
3. method or record keeping
4. number of trials
5. objective: what are we measuring and how are we going to measure it?
6. theoretical assumptions: concentration on sending and receiving data enhances psychic ability and scoring significantly greater than expected by chance (statistically) indicates ESP
7. problems: no way to distinguish clairvoyance from telepathy by this test; sensory leakage and cheating could also account for significant deviation from chance
8. documentation

Calculating chance odds:

With a deck of 25 cards, going through the deck with replacement (i.e., once a card has been selected it is returned to the deck), getting 5 correct (20%) would be about what we'd expect by chance. (We can't be *exactly* sure what would be expected by chance because pure chance is calculated by assuming an *infinite* number of tries.)

We predict that a group of people taking such a test would score at about chance level. For a run of 100 trials, we expect individual scores to range between 12 and 28.

Our procedure:

We ran two trials of 25 tries each that used a computer to generate the cards the sender would concentrate on. I created 50 cards to match the computer selections. We then ran two trials of 25 each with a Zener deck but without replacement and without feedback

(we just went right through the deck after shuffling the cards and did not tell the participants what cards were selected until the test was completed).

Results: Overall, we had 22 participants who got a cumulative 431 correct out of 2,200 chances (19.6%). They got 15 more correct (3.5%) in the last 2 sets of trials (no computer).

The highest score was by a co-conspirator (an ethics teacher) who cheated her way to 56% correct. The highest score by a non-cheater was 25. The lowest was 14.

The cheater was signaled for three of the kinds of cards. Her score was 68% correct on three of the four trials. She could not see my signals in the third trial and only got 5 of 25 correct in that trial.

Discussion:

1. How might we explain the ethics teacher getting 56% when 20% was chance expectation?
2. How might we explain that one student got only 14% right and another got 25% right, if 20% is chance expectation?
3. What conclusion should we draw from our data?
4. How might we improve the design of the test?

Further Reading

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