Philosophy 12: Scientific Reasoning

Instructor

- William Bechtel
  - Office: HSS 8073
  - Office Hours: MW 4:00-4:45
  - Email for this course: phil12@mechanism.ucsd.edu

Sections

A01 Monday, 3 pm, CSB 005

A02 Wednesday, 4pm, CSB 005

TA:

Nathaniel Greely HSS 8033 ngreely@ucsd.edu

Office Hours

- MW 1:50-2:50

Course Website

http://mechanism.ucsd.edu/teaching/f19/

- Syllabus
- Schedule of classes and readings
- Links to
  - Lecture slides
  - Study guides for exams
  - Paper assignments

Course Requirements

1. Web-based exercises (5%)
   These are scored for doing them, not for correctness of answers
2. Lecture participation (10%)
   Clicker scores: two points for answering a question, a third for answering it correctly
3. Section participation (5%)
   Quizzes and participating in discussion
4. Two short (1-2 page) papers (15%@; 30% total)
5. Two in-class exams (15%@; 30% total)
6. Final exam (20%)
   Exams will include multiple choice, short answer, and short essay questions

Inquiry Website

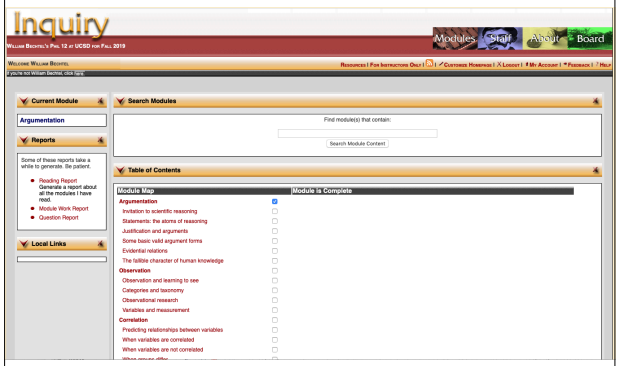
- Inquiry website: http://inquiry.ucsd.edu
- Login directions and initial login code found in printed course reader, *Inquiry into Scientific Reasoning*, available at Price Center bookstore
  - be sure you buy a new reader--used initial logins cannot be reused
- Printed reader doesn't include all course material--website has text, animation, interactive exercises, and questions you are responsible for answering

Web-site Assignments

- Readings (in italics) are titles of modules you're expected to complete before that day's lecture
- Slides from lectures are linked from the title of the lecture

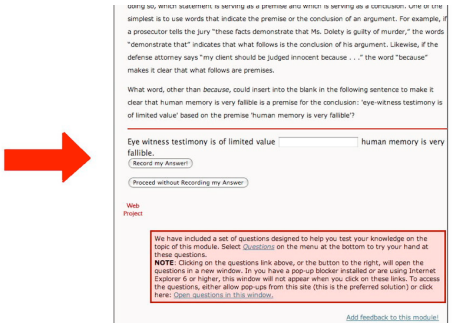
- September 30: Introduction: The Inquiry Website and Exemplary Scientific Reasoning
  October 2: Elements of science: *Introduction to Scientific Reasoning, Statements: the atoms of reasoning; Justification and arguments*
- October 7: Validity and Conditional Statements: *Some basic valid argument forms: Conditional statements*
  Ocober 9: Valid arguments: *Some basic valid argument forms: Conditional arguments*
- October14: Confirmation, falsification, and fallibility: *Evidential relations; The fallible character of human knowledge*

Inquiry Homepage

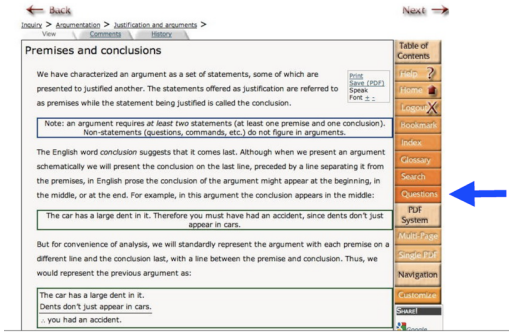


Inquiry Workpage

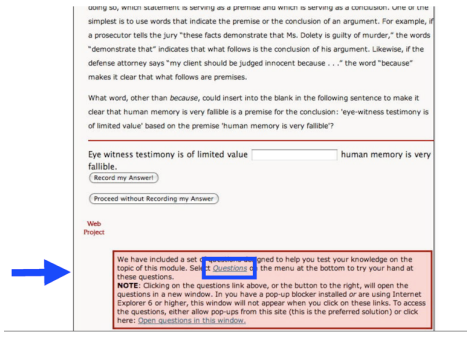
Interactive Exercises



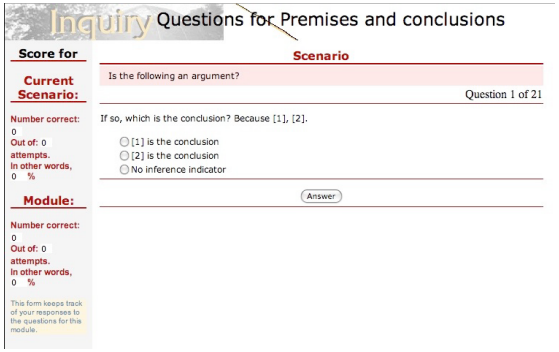
Questions to be Answered - 1



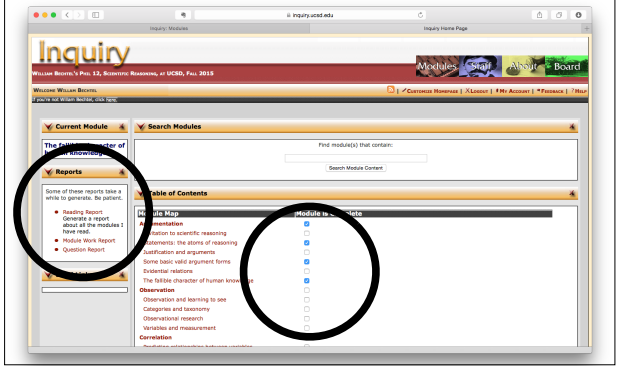
Questions to be Answered - 2



Questions to be Answered - 3



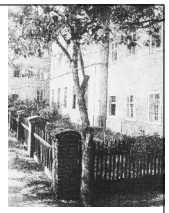
Checking Your Progress



Exemplary Reasoning in Science

- Heredity Prior to Mendel:
  - The basic idea that offspring are similar to their parents had been obvious to people for ages
  - It also was clear that offspring often differ from their parents
- Animal and plant breeders capitalized on these differences
  - By controlling mating and eliminating undesired organisms, breeders were able to produce plants and animals with desired traits
  - By multiply breeding offspring and eliminating variants, breeders could generate pure breeds

Gregor Mendel

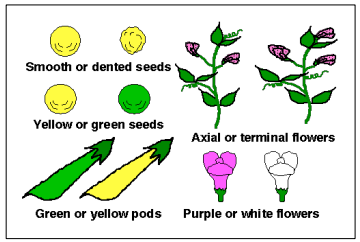


An Augustinian monk, Mendel studied physics and natural science in Vienna, but lived most of his adult life in the cloister at Altbrunn (now Brno in the Czech Republic)

Starting in 1856 he conducted plant breeding experiments in the cloister's garden

Mendel's Breeding Experiments

Choice of peas: naturally self pollinated but easy to cross-pollinate



Mendel's Procedure

Cross-pollinate between pure breeding lines with alternative traits—yellow/green, smooth/dented

All members of the F_1 generation exhibited just one of the traits
- labeled this the *dominant* trait and the other *recessive*

Allow members of the F_1 generation to self-pollinate

First Generation from Hybrids

Form of seed	Round / Wrinkled	5474	1850	2.96:1
Color of albumin	Yellow / Green	6022	2001	3.01:1
Color of seed coat	Violet flowers / White flowers	705	224	3.15:1
Form of pods	Inflated / Constricted	822	299	2.95:1
Color of unripe pods	Green / yellow	428	152	2.81:1
Position of flowers	Axial / terminal	651	207	3.14:1
Length of stem	Long / short	787	277	2.84:1

F_2 Generation

Produced by self-fertilization of members of the F_1 generation

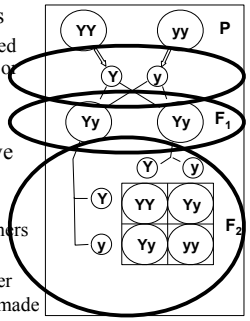
Individuals with recessive traits bred pure

One out of three of those showing the dominant character produced only offspring with the dominant character

Theoretical problem for Mendel—what could *explain* these and other patterns he found?

Mendel's Hypothesis

- Behind the characters lay factors
  - pollen and egg cells each possessed the factor for either the dominant or recessive trait
- What evidence does Mendel have for these factors?
  - Only that they account for the inheritance pattern he saw and others he predicted
  - Without his hypothesis, these other predictions would not have been made



Features of Mendel's Reasoning

He designed a study that could reveal patterns in the phenomena

He found a systematic pattern

He proposed a hypothesis that could explain the pattern

He supported this hypothesis by both the pattern he initially observed and others which it predicted.
These patterns would otherwise be unexpected!

Message: Successfully predicting what would otherwise be unexpected is typically the way hypotheses gain support.