LSC Use Only Proposal No:	UWUCC Use Only Proposal No: 13-82
LSC Action-Date: AP- 10/10/13	UWUCC Action-Date: App- 10/29/13 Senate Action Date: App- 12/3/13

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) Rives, Brad; Rubenstein, Eric	Email Address rives; erubenst
Proposing Department/Unit PHIL	Phone x2310

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

- ☐ New Course
- ☐ Course Prefix Change
- ☐ Course Deletion
- ☑ Course Revision
- ☐ Course Number and/or Title Change
- ☑ Catalog Description Change

Current course prefix, number and full title: PHIL 330 Philosophy of Science

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

- ☐ Learning Skills
- ☐ Knowledge Area
- ☐ Global and Multicultural Awareness
- ☐ Writing Across the Curriculum (W Course)
- ☑ Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)
  - ☐ Global Citizenship
  - ☐ Information Literacy
  - ☐ Oral Communication
  - ☐ Quantitative Reasoning
  - ☑ Scientific Literacy
  - ☐ Technological Literacy

3. Other Designations, as appropriate

- ☐ Honors College Course
- ☐ Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

- ☐ Catalog Description Change
- ☐ Program Revision
- ☐ Program Title Change
- ☐ New Track
- ☐ New Degree Program
- ☐ New Minor Program
- ☐ Liberal Studies Requirement Changes
- ☐ Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)	Eric Rubenstein / Brad Rives	4-30-13
Department Chairperson(s)		5/2/13
College Curriculum Committee Chair	for F. Sutton	5-8-13
College Dean		5-8-13
Director of Liberal Studies (as needed)		10/22/13
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail S Sechrist	10/29/13

Received OCT 21 2013 Liberal Studies

Received SEP 30 2013 Liberal Studies

I. Catalog Description Change
PHIL 330 Philosophy of Science

Current Catalog Description

An investigation into the nature of formal and empirical sciences: structure of scientific thought and its dependence upon or independence of theory; the logical and metaphysical status of scientific laws and theoretical concepts; reductionism in science; the concept of causality; the logic of explanation; problems in confirmation theory; science and value. No special background required. Recommended for math and science majors.

Proposed (New) Catalog Description:

Philosophical investigation into the character of empirical scientific thought and practices: measures of confirmation; the theory ladenness of observation; scientific rationality and the aims of science; the inference from empirical success to truth; the logic of explanation; the character of natural laws; levels of theorizing and intertheoretic reduction; the ideal of objectivity and the place of extra-scientific values in theory appraisal. No special background required.

II. Description of Curriculum Changes

1. PHIL 330: Philosophy of Science New Syllabus of Record

I. Catalog Description

PHIL 330 Philosophy of Science 3c-0l-3cr

Prerequisites: None

Philosophical investigation into the character of empirical scientific thought and practices: measures of confirmation; empirical success; theory ladenness of observation; scientific rationality and the aims of science; the inference from empirical success to truth; the logic of explanation; the character of natural laws; levels of theorizing and intertheoretic reduction; the ideal of objectivity and the place of extra-scientific values in theory appraisal. No special background required.

II. Course Outcomes

Students will be able to:

Objective 1. Describe alternative accounts of the logic of empirical hypothesis testing.

Expected Student Learning Outcomes 1 and 2:

Informed and Empowered Learners

Rationale: Students do short expository papers on inductivist, Popperian, and Bayesian accounts of empirical confirmation/corroboration. This outcome specifically meets **required course content for Scientific Literacy** Liberal Studies electives because students explore hypotheses from physics, astronomy and chemistry, doing short writing assignments to explain how these hypotheses are tested by relevant data. Exploring the logic of empirical corroboration **informs** students about ways of modeling the natural and social worlds and **empowers** them as probabilistic reasoners, generally.

Objective 2. Describe alternative accounts of scientific laws and the logic of scientific explanation.

Expected Student Learning Outcome 2:

Empowered Learners

Rationale: Students do short expository writing comparing models of scientific explanation that divide on whether natural laws are non-logically necessary. Exploring the status of natural laws and the logic of scientific explanation -- with attention to cases from physics, chemistry, and genetics -- **empowers** students to adjudicate scientific explanations offered in public, and

academic, discourse. This outcome specifically meets **required course content for Scientific Literacy** Liberal Studies electives by developing critical thinking skills needed to analyze and appraise explanations given within students' fields of study.

Objective 3. Explain the ideal of a unified science and state necessary conditions for intertheoretic reduction.

Expected Student Learning Outcomes 1 and 2:

Informed and Empowered Learners

Rationale: Students explore relations among and across sciences, doing short expository writing on whether higher-level sciences reduce to lower-level sciences. Case studies include the relations between: Kepler's laws and classical mechanics; classical genetics and molecular biology; classical thermodynamics and statistical mechanics; chemistry and quantum mechanics; and, psychology and neuroscience. Understanding arguments for, and against, the autonomy and irreducibility of higher-level theories **informs** students' about **interrelations across empirical scientific disciplines** and **empowers** them to critically adjudicate contemporary debates about candidate intertheoretic reductions in contemporary psychology/ neuroscience, chemistry/quantum mechanics, and genetics/molecular biology.

Objective 4. Distinguish scientific realism from positivist, and post-positivist, scientific antirealism and appraise the realist/antirealist debate.

Expected Student Learning Outcomes 1 and 2:

Informed and Empowered Learners

Rationale: In both short expository writing and in the term paper, students assess risky inferences from empirical success to evidence-transcendent scientific truth -- with attention to cases from physics, astronomy, and chemistry -- exploring the question whether empirical corroboration warrants belief in all of a theory's content or only its testable content. Understanding and assessing such inferences **informs** students about debates in science, past and present, and **empowers** them as probabilistic reasoners, generally. Students consider whether quantum data from two-slit experiments warrant conclusions supporting quantum mechanics, fully interpreted, or only conclusions supporting quantum mathematics, thinly read. This specifically meets **required course content for Scientific Literacy** Liberal Studies electives insofar as students are **empowered** to adjudicate whether the most highly corroborated theory in history, contemporary quantum mechanics, ought, fully interpreted, to be believed.

Objective 5. Describe the ideal of objective, value-free inquiry and evaluate the role of socio-political agendas in theory appraisal and research program prioritization.

Expected Student Learning Outcomes 1 and 3:

Informed and Responsible Learners

Rationale: Students do short expository writing on values-based criteria for theory appraisal, a subject central to post-Kuhnian debates about the character, and worth, of scientific objectivity, and critically assess arguments that: i. androcentric, and racist, normative bias in theory appraisal is a source of error; and, ii. gynocentric, or multicultural, bias in theory appraisal a genuine epistemic resource. Exposure to the ideal of value-free inquiry **informs** students about empirical scientific presuppositions and practices, as do case studies from astronomy, biology, and geology; discriminating among normative biases exercises critical thinking skills and encourages **responsibility** in rooting out epistemically, or socio-politically, harmful biases.This specifically meets **required course content for Scientific Literacy** Liberal Studies electives insofar as critical appraisal of normative biases in scientific inquiry **informs** students about the impact of science on life and on fields of study.

Objective 6. Corroborate exposition of philosophical positions by use of apt quotation and citation.

Expected Student Learning Outcome 3:

Responsible Learners

Rationale: Students' obligations of textual fidelity and expository accuracy will be reinforced in all paper assignments, both short expository papers and the term paper. Rubrics for all assignments prioritize these virtues.

EUSLOs and Required Content for Scientific Literacy Competency, Summarized:

Specific, telling cases of empirical scientific discovery, hypothesis testing, inference, and explanation -- drawn from contemporary physics, chemistry, biology, and psychology and from the histories of these disciplines -- are examined to uncover the logic of confirmation, the character of natural laws, and the logic of explanation and to understand relations among scientific disciplines. Scrutiny of empirical scientific reasoning and practices puts critical thinking skills at a premium throughout the course. Interrelationships within and across disciplines are addressed with recent or contemporary case studies from psychology/neuroscience, chemistry/ quantum mechanics, and genetics/molecular biology. Case studies from the history of science enhance students' appreciation of the fact that contemporary empirical science is an episode in an historical progression that may include future paradigm shifts.

Course Outline

Unit I. Scientific Rationality: Inductivism, Falsificationism, and Hypothetico-Deductivism **(7.5 hours)**

a. Scientific Rationality *Per Se*: Scientific Goals and their Rational Pursuit
b. Inductivism: Newton's Laws
c. Karl Popper's Falsificationism: Ptolemaic Astronomy, The Phlogiston Theory
d. Predictive Novelty: Classical Mechanics and the Discovery of Neptune; Wave Optics and the Poisson Bright Spot; Quantum Mechanics and Prediction of the Positron

e. Hypothetico-Deductivism and Crucial Experiments: Wave Optics and the Foucault Experiment

Unit II. Laws of Nature **(3 hours) [10.5]**

a. Laws as Generalizations: Kepler's Laws, Newton's Laws
b. Laws as Necessitation Relations: The Ideal Gas Law, Bode's "Law"

Unit III. Scientific Explanation **(4.5 hours) [15]**

a. Carl Hempel's Deductive-Nomological Model of Explanation
b. Carl Hempel's Inductive-Statistical Model of Explanation
c. Explanation and Inference to Unobservables: The Law of Fixed Proportions and the Atomic Hypothesis; Mendelian Inheritance and the Gene Posit; the Rutherford Experiment and Models of the Atom

Unit IV. Early Antirealism and the Language of Theories **(3 hours) [18]**

a. Logical Positivism: Skinnerian Behaviorism
b. Instrumentalism: Newton on Gravitation; J. Dalton and A. Comte on the Atomic Hypothesis
c. Copenhagen and Many Worlds Interpretations of Quantum Mechanics, and the Instrumentalist's Eschewal of Interpreting Quantum Mechanics *Per Se*.

Unit V. The Unity of Science and Intertheoretic Reduction **(4.5 hours) [22.5]**

a. Ernst Nagel's Logical Empiricist Account of Intertheoretic Reduction
b. Jerry Fodor's Argument for Irreducible, Special Sciences
c. Case Studies: Kepler's Laws and Newton's Laws; Classical Genetics and Molecular Biology; Classical Thermodynamics and Statistical Mechanics; Chemistry and Quantum Mechanics; Psychology and Neuroscience

Unit VI. The Quine-Duhem Thesis and Underdetermination of Theory by Data (4.5 hours) [27]

a. The Quine-Duhem Thesis
b. The Theory-Ladenness of Observation: Standard Candles and the Age of the Universe
c. Recalcitrant Data and *Ad Hoc* Maneuvers: The Foucault Experiment; Prout's Hypothesis; The Michelson-Morley Experiment
d. Strong Underdetermination as a Threat to Reasoned Theory Appraisal
e. Arguments that the Threat is Exaggerated

Unit VII. Scientific Realism and Scientific Antirealism **(7.5 hours) [34.5]**

a. Richard Boyd's Scientific Realism: Truth as the Explanation for Empirical Success, and Truth as the Aim of Science
b. Success without Truth: Ptolemaic Astronomy; Phlogiston Theory; Optical Ether and Wave Optics
c. Bas van Fraassen's Constructive Empiricist Antirealism
d. Acceptance without Belief: Antirealism about Quantum Mechanics
e. Realist Replies to van Fraassen and van Fraassen's Rejoinders

Unit VIII. Scientific Rationality: Bayesian Confirmation Theory **(3 hours) [37.5]**

a. Rudiments of Bayesian Confirmation Theory
b. Challenges to Bayesianism as an Account of Scientific Rationality

Unit IX. Rationality, Objectivity, and Values in Science (4.5 hours) [42]

a. Thomas Kuhn on the Methodology of Normal, and Revolutionary, Science
b. Incommensurability, Unshared Values, and Value-Laden Theory Appraisal: Ptolemaic and Copernican Astronomy; Catastrophist and Gradualist Geology
c. Objectivity and Value-Laden Theory Appraisal: Gender and the Biological Sciences

Culminating Activity (2 hours)

Open discussion of term paper theses.

IV. Evaluation Methods

2. (50%) Short Expository Writing Assignments -- Approximately eight one page papers for which students are expected to read carefully, recapitulate accurately, cite sources, and write clearly and precisely; weighted equally.

3. (10%) Term Paper Draft -- Ten page term paper draft submitted for professor's feedback.

4. (40%) Term Paper -- Fifteen page term paper defending a thesis deriving from an advanced unit of the course; students are expected to explain a debate space, cite and quote sources, defend a thesis, pose strong objections, and reply.

V. Grading Scale

A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	0 - 59%

VI. Undergraduate Course Attendance Policy

Attendance policy is in conformity with standards set by the University Senate, as outlined in the Undergraduate Catalog: it will be distributed in writing to students during the first week of the course; it will recognize students' need to miss class because of illness or personal emergency; and, it will define some limited level of allowable absence.

VII. Required Textbook(s), Supplemental Books and Readings

Curd, Martin, Cover, Jan, and Pincock, Christopher (eds.), *Philosophy of Science: The Central Issues*, 2nd edition (New York: W. W. Norton; 2012).

The required text is an anthology of essays, excerpted from books or reprinted from academic journals; all readings are primary source, non-textbook readings. An alternative would be the text below, which has a similar character.

Kourany, Janet, *Scientific Knowledge*, 2nd edition (Wadsworth; 1998).

Supplemental Reading: Dirac, Paul, "The Theory of Electrons and Positrons," in *Nobel Lectures, Physics, 1922 - 1941* (Amsterdam: Elsevier Publishing Company, 1965).

VIII. Special Resource Requirements
There are no special resource requirements.

IX. Bibliography
Alcoff, Linda, and Elizabeth Potter (eds.), *Feminist Epistemologies* (London: Routledge; 1983).

Ayer, Alfred J., 'What is a law of nature?', in *Revue Internationale de Philosophie*, 36 (1956): 144 - 165.

Bohr, Niels, *Atomic Physics and Human Knowledge* (Mineola, NY: Dover; 2010).

——, 'Can Quantum-mechanical Description of Physical Reality Be Considered Complete?', in *Physical Review*, 48 (Brookhaven, NY: American Physical Society; 1935).

Bell, John, 'On the Einstein-Podolsky-Rosen Paradox', in *Physics*, 1 (Physics Publishing Company; 1964).

Bovens, Luc, and Stephan Hartmann, *Bayesian Epistemology* (Oxford: Clarendon Press; 2003).

Boyd, Richard, 'On the Current Status of the Issue of Scientific Realism', in *Erkenntnis*, 19 (Springer Netherlands; 1983): 45 - 90.

Carnap, Rudoph, *Philosophical Foundations of Physics* (New York: Basic Books; 1966).

Churchland, Paul and Hooker, Clifford, (eds.), *Images of Science: Essays on Realism and Empiricism (with a reply from Bas C. van Fraassen)* (Chicago: University of Chicago Press; 1985).

Clagett, Marshall, *Critical Problems in the History of Science* (Madison: University of Wisconsin Press; 1969).

Dewitt, Richard, *Worldviews: An Introduction to the History and Philosophy of Science* (Padstow: Blackwell Publishing; 2004).

Dirac, Paul, 'Theory of Electrons and Positrons' in Ferris, T., *The World Treasury of Physics, Astronomy, and Mathematics* (Boston, MA: Little, Brown, and Company; 1991).

Dretske, Fred, 'Laws of Nature', in *Philosophy of Science*, 44 (1977): 248 - 68.

Duhem, Pierre, *The Aim and Structure of Physical Theory* (Princeton, NJ: Princeton University Press; 1954).

Earman, John, *Bayes or Bust? A Critical Examination of Bayesian Confirmation Theory* (Cambridge, MA: MIT Press; 1992).

Einstein, Albert, Boris Podolsky, and Nathan Rosen, 'Can Quantum-mechanical Description of Physical Reality Be Considered Complete?', in *Physical Review*, 47 (Brookhaven, NY: American Physical Society; 1935).

Feynmann, Richard, 'Atoms in Motion' in Ferris, T., *The World Treasury of Physics, Astronomy, and Mathematics* (Boston, MA: Little, Brown, and Company; 1991).

Fodor, Jerry, 'The Special Sciences', in *Synthese*, 28 (1974): 97 - 115.

Hacking, Ian, *Representing and Intervening* (Cambridge: Cambridge University Press; 1983).

Harding, Sandra, *Is Science Multicultural?: Postcolonialisms, Feminisms, and Epistemologies*(Bloomington, Ind.: Indiana University Press; 1998).

Heisenberg, Werner, *The Physical Principles of Quantum Theory* (Mineola, NY: Dover; 1949).

——, *Physics and Philosophy: The Revolution in Modern Science* (New York: HarperCollins; 2007).

Hempel, Carl G., *Aspects of Scientific Explanation* (New York: Free Press; 1965).

Intemann, Kristen, 'Feminism, Underdetermination, and Values in Science' in *Philosophy of Science*, 72 (2005): 1001 - 1012.

Jarayantne, Toby, and Stewart, Abigail, 'Quantitative and Qualitative Methods in the Social Sciences: Current Feminist Issues and Practical Strategies', in *Beyond Methodology*, Fonow, Mary, and Cook, Judith, (eds.) (Bloomington, Ind.: Indiana University Press; 1991).

Kitcher, Philip, '1953 and All That: A Tale of Two Sciences', in *Philosophical Review* (Ithaca: Cornell University Press; 1984).

Kuhn, Thomas, *The Structure of Scientific Revolutions*, 3rd edition (Chicago: University of Chicago Press; 1996).

——, *The Copernican Revolution*: *Planetary Astronomy in the Development of Western Thought* (Cambridge, MA: Harvard University Press; 1992).

Lange, Marc, *The Philosophy of Physics* (Malden, MA: Blackwell Publishing; 2002).

Laudan, Larry, 'A Confutation of Convergent Realism', in *Philosophy of Science*, 48 (1981): 19–48.

Laudan, Larry, and Jarrett Leplin, 'Empirical Equivalence and Underdetermination', in *Journal of Philosophy*, 88 (1991): 449–472.

Lipton, Peter, *Inference to the Best Explanation*, 2nd edition (London: Routledge; 2004).

Longino, Helen, *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry* (Princeton: Princeton University Press; 1990).

——, *The Fate of Knowledge* (Princeton: Princeton University Press; 2002).

Lyons, Thomas D., 'Explaining the Success of a Scientific Theory', in *Philosophy of Science*, 70: (2003) 891–901.

Maxwell, Grover, 'On the Ontological Status of Theoretical Entities', in H. Feigl and G. Maxwell (eds.), *Scientific Explanation, Space, and Time, Minnesota Studies in the Philosophy of Science, Volume III* (Minneapolis: University of Minnesota Press; 1962).

Monton, Bradley (ed.), *Images of Empiricism: Essays on Science and Stances, with a Reply From Bas C. Van Fraassen* (Oxford: Oxford University Press; 2007).

Musgrave, Alan, 'Constructive Empiricism and Realism', in Churchland, Paul and Hooker, Clifford (eds.), *Images of Science: Essays on Realism and Empiricism (with a reply from Bas C. van Fraassen)* (Chicago: University of Chicago Press; 1985).

Nagel, Ernest, 'Issues in the Logic of Reductive Explanations', in *Teleology Revisited* (New York: Columbia University Press; 1974): 95 - 113.

Nelson, Lynn Hankinson, 'Epistemological Communities', in Alcoff, Linda, and Potter, Elizabeth (eds.) *Feminist Epistemologies* (New York: Routledge; 1993).

Okruhlik, Kathleen, 'Gender and the Biological Sciences', *Canadian Journal of Philosophy* Suppl. 20 (1994): 21 - 42.

Quine, Willard V. O., 'Two Dogmas of Empiricism', in *From a Logical Point of View* (Cambridge, Ma: Harvard University Press; 1951): 20 - 43.

Popper, Karl, *The Logic of Scientific Discovery*, 3rd edition (London: Hutchinson; 1968).

——, *Conjectures and Refutations: The Growth of Knowledge*, 4th edition (London: Routledge & Kegan Paul; 1972).

Psillos, Stathis, *Knowing the Structure of Nature: Essays on Realism and Explanation* (London: Palgrave Macmillan; 2009).

Redhead, Michael, *Incompleteness, Nonlocality, and Realism: A Prolegomenon to the Philosophy of Quantum Mechanics* (Oxford: Oxford University Press; 1999).

Rosen, Gideon, 'What is Constructive Empiricism?', in *Philosophical Studies*, 74 (1994): 143–178.

Salmon, Wesley, *Four Decades of Scientific Explanation (*Minneapolis: University of Minnesota Press; 1990).

Sober, Elliott, 'Bayesianism—Its Scope and Limits', in Swinburne, Richard, ed., *Bayes's Theorem* (Oxford: Oxford University Press; 2002): 21-38.

Stanley, Liz, and Wise, Sue, *Breaking Out: Feminist Consciousness and Feminist Research* (London: Routledge and Kegan Paul; 1983).

Strevens, Michael, 'Bayesian Confirmation Theory: Inductive Logic, or Mere Inductive Framework?', in *Synthese*, 141 (2004): 365-379.

Toulmin, Stephen and Goodfield, Jane, *The Architecture of Matter* (Chicago: University of Chicago Press; 1982).

van Fraassen, Bas C., 'Constructive Empiricism Now', in *Philosophical Studies*, 106 (2001): 151–170.

——, 'Empiricism in the Philosophy of Science', in Churchland, Paul, and Hooker, Clifford (eds.), *Images of Science: Essays on Realism and Empiricism, (with a reply from Bas C. van Fraassen)* (Chicago: University of Chicago Press; 1985).

——,'Gideon Rosen on Constructive Empiricism', in *Philosophical Studies*, 74 (1994): 179–192.

——, *Quantum Mechanics: An Empiricist View* (Oxford: Oxford University Press; 1991).

——, *The Scientific Image* (Oxford: Oxford University Press; 1980).

Wylie, Alison, and Nelson, Lynn Hankinson, 'Coming to Terms with the Values of Science: Insights from Feminist Science Studies Scholarship', in Kincaid, Harold, Dupre John, and Wylie, Alison (eds.), *Value-Free Science? Ideals and Illusion* (New York: Oxford University Press; 2007).

2. Summary of Proposed Revisions

a. Catalog description change
b. Linking revised course outline and revised objectives to the Scientific Literacy Liberal Studies Elective area
c. Updating the bibliography

3. Justification for Proposed Revisions

a. Catalog description changes are stylistic, not substantive, with one exception; reference to "formal sciences" has been deleted. Philosophy of logic and philosophy of mathematics are not covered in Philosophy 330, and neither were they covered in the old syllabus of record.

b. The course outline and objectives have been updated to reflect and map to the EUSLOs in the Scientific Literacy Liberal Studies Elective area.
c. The bibliography has been updated to reflect disciplinary developments and to include the perspectives of women and ethnic, and racial, minorities.

III. Letters of Support

Date: April 5, 2013

Re: PHIL 330: Philosophy of Science

Dear Dr. MacLeod,

The Natural Sciences and Mathematics Curriculum Committee reviewed your Philosophy of Science revision as a Scientific Literacy LS Elective. I have been asked to write a letter in response.

The committee unanimously thought the course sounded interesting, but that it is unquestionably a philosophy course, and does not increase the scientific literacy of students in today's world.

The LS requirements state that a Scientific Literacy EUSLO is "As Informed Learners, students will demonstrate knowledge and understanding of the interrelationships within and across disciplines." We interpret this requirement as meaning that students will understand the interrelationship within and between their discipline and the scientific disciplines, rather than that students will learn to apply different philosophical methods to historical theories from science.

LS Scientific Literacy course proposals "must investigate relevance, application and impact of science to student's life or field of study". We do not think PHIL 330 meets this requirement. While the scientific examples in PHIL 330 cross many branches of science, the emphasis on historical examples (e.g., Ptolemy, Rutherford, Mendel, Kepler) limits the scientific literacy value for the modern world and the future. The connection of modern science to student's life or field of study is absent.

LS Scientific Literacy course proposals "must apply problem solving and critical thinking skills". Since the course is about scientific literacy, we interpret the requirement as intending to help students navigate the plethora of scientific information available today, by increasing their knowledge of science through its major theories, vocabulary, methods and problem solving techniques. PHIL 330 does not meet this requirement.

LS Scientific Literacy course proposals "must transform information to explore hypotheses and draw conclusions". We interpret this requirement that students must read scientific articles to explore scientific hypotheses and draw conclusions about the science. You acknowledge in your proposal that students do not do this requirement (page 3) because they are "considering the logic and warrant of confirmation by data *per se*." We do not think this course will increase student scientific literacy in the modern world, since they will be studying historical cases where the conclusions have already been drawn.

The course description fits the course content when it states that the course is a philosophical investigation into the "character of empirical scientific thought and practices"; it is not an investigation into empirical scientific thought and practices. As such, while we think the course sounds interesting, and indeed sounds an excellent philosophy course, we do not think the course fits the intended goals of scientific literacy.

Sincerely,

Anne Kondo, for the NSM College Curriculum Committee

Sample Assignment for Liberal Studies Course

Term Paper Assignment

Please defend a position on the scientific realism/antirealism debate, showing knowledge of the readings and lectures. Be sure your paper defends a thesis. The paper should defend either scientific realism (SR) or else antirealism (AR).

At root, the debate concerns the abductive inference from the empirical success of a theory to its approximate truth and the relevance of this inference to the aims of science. Review the main points of the debate with textual fidelity and argumentative orientation. Announce your position, contrast with the alternative, give an initial defense, and then proceed to objections. If you are defending SR, charitably present two objections to SR. For each objection to SR you pose, do the following: explain how the objection threatens SR; explain how SR does or could respond; explain how AR does or could reply; and give a final SR rejoinder. If you are defending AR, charitably present at least two objections to AR. For each objection to AR you pose, do the following: explain how the objection threatens AR; explain how AR does or could respond; explain how SR does or could reply; and give a final AR rejoinder. Be sure to end each cycle with moves you can endorse, given your thesis. Once your objection/reply cycles are complete, please summarize the case for your position.

Term Paper Rubric

Your grade will be based on your performance in the five categories listed below, equally weighted, for a maximum of 100 points.

1. Scientific realism: Exposition/Textual Grounding
2. Scientific antirealism: Exposition/Textual Grounding
3. Objection/Reply/Rejoinder Cycle One: Exposition/Textual Grounding
4. Objection/Reply/Rejoinder Cycle Two: Exposition/Textual Grounding
5. Defense of Thesis: Argumentative Orientation and Effectiveness

For each of categories 1. through 4., your grade out of twenty will be decided as below.

Exposition excellent, and textual corroboration excellent:	19 - 20
Exposition clear and complete and textual corroboration apt:	18 - 19
Exposition clear and complete but textual corroboration weak:	16 - 17
Exposition unclear or incomplete but textual corroboration apt:	16 - 17
Exposition mistaken or incomplete and/or textual corroboration weak:	14 - 15
Exposition mistaken and/or no textual corroboration:	12 - 13
Category disregarded:	10 - 11

For category 5., your grade out of twenty will be decided as below.

Argumentation and handling of objections excellent:	19 - 20
Argumentation and handling of objections very good:	18 - 19
Argumentation good but handling of objections sometimes ineffective:	16 - 17
Argumentation good but sometimes lacking focus or orientation:	16 - 17
Argumentation and handling of objections incomplete or mistaken:	14 - 15

Argumentation and handling of objections very incomplete:	12 - 13
Category disregarded:	10 - 11

PHIL 330 Liberal Studies Approval Questions

1. This course is not a multiple-section, multi-instructor course.

2. In Unit VII., students read at least two essays by feminist scholars on non-cognitively evaluative criteria for theory appraisal, a subject central to post-Kuhnian debates about the character, and worth, of scientific objectivity, and critically assess arguments that: i. androcentric, and racist, normative bias in theory appraisal is a source of error; and, ii. gynocentric or multicultural bias in the same a genuine epistemic resource (Longino, 2002, Okruhlik, 1994, Wylie and Nelson, 2007). Alternatively, students might read arguments that quantitative social scientific generalization violates a feminist imperative to respect gendered, ethnic, racial, and cultural differences and also replies from feminist scholars in defense of quantitative social scientific methods and generalization (Stanley and Wise, 1983, Jayaratne and Stewart, 1991).

3. Instructors of this course will use an anthology of primary non-fiction texts. Students will typically read particular journal articles, or non-textbook book excerpts, not found in the anthology of choice, as well.

4. The course does not presuppose prior knowledge of philosophy, and is intended as a general introductory survey of debates in the philosophy of science. Two groups of students take this course: Philosophy majors and minors, and students seeking to satisfy Liberal Studies Elective or Writing Intensive requirements. Issues in the philosophy of science are new to both groups, and so all students must be introduced to rudimentary topics in the philosophy of science during the first half of the semester. In the second half, students study advanced debates that are solidly grounded in the rudiments, and the two groups have performed comparably, historically.

Please describe how you are defining your standards for these objectives, and how you will determine whether they have been met by students.

Student learning outcomes are assessed using short expository writing assignments, a ten page term paper draft assignment, and a fifteen page term paper assignment. Objectives 1 - 6 will be measured by short expository writing assignments. Objectives 4 and 6 will be measured by the term paper assignment.

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

LSC Use Only	
Number	
Action	
Date	

UWUCC Use Only	
Number	
Action	
Date	

I. TITLE/AUTHOR OF CHANGE

COURSE/PROGRAM TITLE PH 330 Philosophy of Science

DEPARTMENT Philosophy & Religious Studies

CONTACT PERSON Dr. Dan Boone

II. THIS COURSE IS BEING PROPOSED FOR:

___ Course Approval Only

___ Course Approval and Liberal Studies Approval

X Liberal Studies Approval only (course previously has been approved by the University Senate)

III. APPROVALS

Albert E Bonfield
Department Curriculum Committee

Joel Wack (11-30-89)
Department Chairperson

College Curriculum Committee

College Dean*

Director of Liberal Studies
(where applicable)

Provost
(where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. TIMETABLE

Date Submitted to LSC ____
to UWUCC ____

Semester/Year to be implemented ____

Date to be published in Catalog ____

Revised 5/88

[Attach remaining parts of proposal to this form.]

COURSE SYLLABUS

I. CATALOG DESCRIPTION

PH330 Philosophy of Science 3 credits

An investigation into the nature of formal and empirical sciences: structure of scientific thought and its dependence upon or independence of theory; the logical and metaphysical status of scientific "laws" and theoretical concepts; reductionism in science; the concept of causality; the logic of explanation; problems in confirmation theory; science and value. No special background required. Recommended for math and science majors.

II. COURSE OBJECTIVES

1. Students will learn the nature of scientific reasoning from an "informed citizen" perspective; students will be led to understand, challenge, and criticize scientific reports on the basis of the logic of scientific justification. Students are brought to realize that this skill requires no special scientific expertise or knowledge.

2. Students will investigate a variety of special topics concerning the relationships between science and society.

3. Students will explore some fundamental philosophical questions about the nature of science.

4. Students will become acquainted with philosophical implications of the sciences about human nature.

III. TYPICAL COURSE OUTLINE (may vary with instructor)

A. The nature of scientific reasoning
   1. Basic reasoning concepts
   2. Theories and hypotheses
   3. Testing theoretical hypotheses
B. Science and religion
C. Science and human nature
D. Scientific Methodology
E. Scientific Explanation
F. Science and values
G. Science and society

IV. EVALUATION METHODS

Actual evaluation methods may vary from instructor to instructor, but the instructor who has traditionally taught this course is seeking approval to teach writing-intensive courses and believes this course would be ideal for that purpose.

V. REQUIRED TEXTBOOKS

Ronald N. Giere, Understanding Scientific Reasoning, Holt, Rinehart and Winston, 1984.

Frederick E. Mosedale, Philosophy and Science, Prentice-Hall, 1979.

James D. Watson, The Double Helix, Atheneum, 1968.

A

LIBERAL STUDIES COURSE APPROVAL FORM

About this form: Use this form only if you wish to have a course included for Liberal Studies credit. The form is intended to assist you in developing your course to meet the university's Criteria for Liberal Studies, and to arrange your proposal in a standard order for consideration by the LSC and the UWUCC. If you have questions, contact the Liberal Studies Office, 353 Sutton Hall; telephone, 357-5715.

Do not use this form for technical, professional, or pre-professional courses or for remedial courses, none of which is eligible for Liberal Studies. **Do not** use this form for sections of the synthesis course or for writing-intensive sections; different forms will be available for those.

PART I. BASIC INFORMATION

A. For which category(ies) are you proposing the course? Check all that apply.

LEARNING SKILLS

____ First English Composition Course
____ Second English Composition Course
____ Mathematics

KNOWLEDGE AREAS

____ Humanities: History
____ Humanities: Philosophy/Religious Studies
____ Humanities: Literature
____ Fine Arts
____ Natural Sciences: Laboratory Course
____ Natural Sciences: Non-laboratory Course
____ Social Sciences
____ Health and Wellness
____ Non-Western Cultures
__X__ Liberal Studies Elective .

B. Are you requesting regular or provisional approval for this course?

__X__ **Regular** _____ **Provisional** (limitations apply, see instructions)

C. During the transition from General Education to Liberal Studies, should this course be listed as an approved substitute for a current General Education course, thus allowing it to meet any remaining General Education needs? __X__ **yes** _____ **no**

If so, which General Education course(s)? PH 221 Symbolic Logic I

PART II. WHICH LIBERAL STUDIES GOALS WILL YOUR COURSE MEET? Check all that apply and attach an explanation.

All Liberal Studies courses must contribute to at least one of these goals; most will meet more than one. As you check them off, please indicate whether you consider them to be primary or secondary goals of the course. [For example, a history course might assume "historical consciousness" and "acquiring a body of knowledge" as its primary goals, but it might also enhance inquiry skills or literacy or library skills.] Keep in mind that no single course is expected to shoulder all by itself the responsibility for meeting these goals; our work is supported and enhanced by that of our colleagues teaching other courses.

	Primary	Secondary
A. Intellectual Skills and Modes of Thinking:		
1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process.	X	
2. Literacy--writing, reading, speaking, listening		
3. Understanding numerical data		X
4. Historical consciousness		
5. Scientific inquiry	X	
6. Values (ethical mode of thinking or application of ethical perception)		X
7. Aesthetic mode of thinking		
B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person	X	
C. Understanding the Physical Nature of Human Beings		
D. Certain Collateral Skills:		
1. Use of the library		
2. Use of computing technology		

PART III. DOES YOUR COURSE MEET THE GENERAL CRITERIA FOR LIBERAL STUDIES? Please attach answers to these questions.

A. If this is a multiple-section, multiple-instructor course, there should be a basic equivalency (though not necessarily uniformity) among the sections in such things as objectives, content, assignments, and evaluation. Note: this should not be interpreted to mean that all professors must make the same assignments or teach the same way; departments are encouraged to develop their courses to allow the flexibility which contributes to imaginative, committed teaching and capitalizes on the streangths of individual faculty.

What are the strategies that your department will use to assure that basic equivalency exists? Examples might be the establishment of departmental guidelines, assignment of repsonsibility to a coordinating committee, exchange and discussion of individual instructor syllabi, periodic meetings among instructors, etc.

See explanation.

B. Liberal Studies courses must include the perspectives and contributions of ethnic and racial minorities and of women wherever appropriate to the subject matter. **If your attached syllabus does not make explicit that the course meets this criterion, please append an explanation of how it will.**

See explanation.

C. Liberal Studies courses must require the reading and use by students of at least one, but preferably more, substantial works of fiction or nonfiction (as distinguished from textbooks, anthologies, workbooks, or manuals). **Your attached syllabus must make explicit that the course meets this criterion.**

[The only exception is for courses whose primary purpose is the development of higher level quantitative skills; such courses are encouraged to include such reading, but are not expected to do so at the expense of other course objectives. **If you are exercising this exception, please justify here.**]

See explanation.

D. If this is an introductory course intended for a general student audience, it should be designed to reflect the reality that it may well be the only formal college instruction these students will have in that discipline, instead of being designed as the first course in a major sequence. That is, it should introduce the discipline to students rather than introduce students into the discipline. **If this is such an introductory course, how is it different from what is provided for beginning majors?**

See explanation.

E. The Liberal Studies Criteria indicate six ways in which all courses should contribute to students' abilities. **To which of the six will your course contribute? Check all that apply and attach an explanation.**

X 1. Confront the major ethical issues which pertain to the subject matter; realize that although "suspended judgment" is a necessity of intellectual inquiry, one cannot live forever in suspension; and make ethical choices and take responsibility for them.

X 2. Define and analyze problems, frame questions, evaluate available solutions, and make choices

X 3. Communicate knowledge and exchange ideas by various forms of expression, in most cases writing and speaking.

X 4. Recognize creativity and engage in creative thinking.

X 5. Continue learning even after the completion of their formal education.

X 6. Recognize relationships between what is being studied and current issues, thoughts, institutions, and/or events.

PART IV. DOES YOUR COURSE MEET THE CRITERIA FOR THE CURRICULUM CATEGORY IN WHICH IT IS TO BE LISTED?

Each curriculum category has its own set of specific criteria in addition to those generally applicable. The LSC provides copies of these criteria arranged in a convenient, check-list format which you can mark off appropriately and include with your proposal. **The attached syllabus should indicate how your course meets each criterion you check. If it does not do so explicitly, please attach an explanation.**

CHECK LIST -- LIBERAL STUDIES ELECTIVES

Knowledge Area Criteria which the course must meet:

__X__ Treat concepts, themes, and events in sufficient depth to enable students to appreciate the complexity, history, and current implications of what is being studied; and not be merely cursory coverages of lists of topics.

__X__ Suggest the major intellectual questions/problems which interest practitioners of a discipline and explore critically the important theories and principles presented by the discipline.

__X__ Allow students to understand and apply the methods of inquiry and vocabulary commonly used in the discipline.

__X__ Encourage students to use and enhance, wherever possible, the composition and mathematics skills built in the Skill Areas of Liberal Studies.

Liberal Studies Elective Criteria which the course must meet:

__X__ Meet the "General Criteria Which Apply to All Liberal Studies Courses."

__X__ Not be a technical, professional, or pre-professional course.

Explanation: Appropriate courses are to be characterized by learning in its broad, liberal sense rather than in the sense of technique or professional proficiency. For instance, assuming it met all the other criteria for Liberal Studies, a course in "Theater History" might be appropriate, while one in "The Craft of Set Construction" probably would not; or, a course in "Modern American Poetry" might be appropriate, while one in "New Techniques for Teaching Writing in the Secondary Schools" probably would not; or, a course on "Mass Media and American Society" might be appropriate, while one in "Television Production Skills" probably would not; or, a course in "Human Anatomy" might be appropriate, while one in "Strategies for Biological Field Work" probably would not; or, a course in "Beginning French" might be appropriate, while one in "Practical Methods for Professional Translators" probably would not.

LIBERAL STUDIES COURSE APPROVAL FORM EXPLANATIONS
PH 330 Philosophy of Science

PART I. Please see items checked.

PART II. Liberal Studies Goals

A. Intellectual Skills and Modes of Thinking

The primary intellectual skills the course addresses are logical criticism and scientific inquiry. First, the course introduces students to some basic logical concepts, which are then used to explain the nature of scientific reasoning. Second, the students are given a great deal of practice in evaluating reports of scientific research to critically assess whether or not the research meets certain standards of scientific reasoning. Third, the course explores a number of topics leading to a better understanding of scientific inquiry: induction, paradigm-shifts, paradoxes of confirmation, the nature of explanation, etc. Because of the range of controversial views about science, students become aware that science itself is a subject of inquiry, and are thereby encouraged to give up any superficial views about the nature of science they may have held.

A secondary goal of the course is "understanding numerical data". Various examples of scientific theories and research used in the course involve mathematics. Thus, some reinforcement of these skills occurs.

Another secondary goal is "values". There are a number of ethical concerns in the sciences, and one part of the course is devoted to those concerns. The general notion of science being "value-neutral" is challenged, and other issues in ethical theory are addressed, such as moral relativism. Specific ethical concerns such as the use of animal and human experimental subjects are also examined.

B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person

A primary goal of the course is to make students "science-literate" in a very important way. By examining the fundamental nature of how scientists justify their research claims to each other and to the wider community, students become critical thinkers of scientific claims. This is an essential skill for all citizens to have in a modern, technologically-complex, and science-dominated society. Students should emerge from the course with a demythologized and demystified view of science. Moreover, the other issues touched upon in the course should also increase a student's

science literacy.

PART III. General Criteria

A. Basic Equivalency

Basic equivalency of all sections of this course would be assured by the following process. All instructors who have taught this course or intend to teach the course the following academic year will meet and review this document, including the generic syllabus. They will exchange individual syllabi and then will discuss whether or not they are adequately meeting the specific goals and criteria approved for this course and outline herein. Any problems or conflicts would be brought to the attention of the entire department for resolution.

B. Perspectives and Contributions of Ethnic and Racial Minorities and of Women

One of the issues to be addressed in the course is sexism and racism in science. Ways in which science may be misused to justify ethnic, racial, or gender discrimination will also be examined. Nonsexist and nonracist language will be used throughout the course, or pointed out and criticized when met with in examples.

C. Required Readings

One of the required books, The Double Helix, is a delightful and exciting journey through one of the most dramatic events in the history of science. Students will be required to read the book; appropriate references will be made to it in discussions throughout the semester.

D. How This Course Differs From an Introductory Majors Course

First of all, there is no special course in our department designed to introduce our majors into the discipline. But even if there were, this proposed course would differ from such a course because it is not primarily aimed at our majors. While the course does treat most of the subjects traditionally covered in a philosophy of science course, there is no assumption that students have any background in science or philosophy. The course is an approved General Education regular-substitute for PH 221 with an audience of students from all over the university seeking to satisfy that requirement. The topics and issues covered should be of broad concern to any educated citizen.

E. Six ways of Contributing to Students' Abilities

1. Students will encounter profound challenges to the thesis that science is in some way "value-neutral". They will discover other ways in which science has serious implications for ethical and social issues, and learn that merely by being "scientific", one is not absolved from responsibility and ethical demands.

2. Students will learn to read all reports of scientific research with a critical eye, not from the standpoint of an expert scientist, but from the standpoint of an ordinary citizen who knows what standards justified claims must meet and who is able to evaluate the research accordingly.

3. When the course was taught in the past, students were not given only objective tests, but had to write evaluations of scientific reports. Also, a paper was an option. If the course is taught as a writing-intensive course, this will even more thoroughly enhance student communication skills.

4. While the course will not especially improve creativity, the issue of creativity in the sciences is discussed. Thus, students will at east understand creative processes better.

5. It is hoped that this course will contribute greatly to life-long learning. An improved understanding of science and a skill of evaluating scientific reasoning should be constantly challenged in our science-intensive society.

6. Efforts are made throughout the course to make examples as current as possible, and to use other topical issues to illuminate points covered in the course.

PART IV. Specific Criteria for the Curriculum Category

It is hoped that the syllabus makes it clear enough that breadth is important to the course. However, depth matters too, at least for some of the central issues. Scientific methodology and explanation are two important categories which receive considerable attention. Also, the initial skill of evaluating scientific reasoning requires a great deal of course time. The major issues, methods of inquiry, and vocabulary are introduced on a number of occasions in connection with disparate issues. Also, as mentioned earlier in the proposal, there is some use of mathematical and writing skills in the course.

It is explained above (Part III) how the course meets the "General Criteria". Moreover, it was also mentioned above (III.D.) that the course is not designed or taught as a narrow course for Philosophy majors.

PH 330 Philosophy of Science (Writing Intensive)
Dr. Dan Boone
Sutton 450
357-5613

Spring, 1996

REQUIRED TEXTS:

Understanding Scientific Reasoning (3rd ed.), Ronald N. Giere

Scientific Knowledge, Janet A. Kourany

COURSE REQUIREMENTS:

I. The student will first learn Giere's "Program" for evaluating scientific research. This is covered in Chapters 2-4 of Giere's book. There will be ample practice on cases so that the student learns thoroughly how to apply the Program.

The student will then be expected to apply the Program to four additional cases assigned by the instructor and one case found by the student. This will be a take-home written assignment. Further specific instructions and "checklist assessment" forms will be provided later. There will be an initial draft and a final draft (both typed) for each case study. The final drafts will total approximately 10-15 pages and will count for 40% of the course grade.

II. The second part of the course will focus on the Kourany text. We will proceed through the text in the order of readings given below. The student is required to write five (5) short (1-2 pages) article reviews of these articles. The initial draft will be due in class the day the article is discussed and the student must be present in class for that discussion. The final draft will be due two class meetings after the initial draft is returned by the instructor (except at the end of the semester, when the due dates may need to be adjusted). Only the grade on the final draft counts. More specific instructions and "checklist assessment" forms will be provided later. If a student is dissatisfied with her/his grades on earlier article reviews, she/he may substitute ones written later--only the highest 5 grades will count. Each article review counts for 8%, so the total is 40% of the course grade.

Readings (by page numbers in Kourany): 3, 30, 51, 65, 122, 139, 158, 170, 197, 208, 235, 253, 266, 276, 296 & 326, 343, 359, 388.

III. The third requirement is that the student write a short "position" paper, supporting one view covered in the Kourany readings. This paper should be 5-7 pages in length and the first draft is due April 9. At least one other article besides the Kourany readings must be used in writing this paper. Checklist assessment forms with more specific instructions will be provided later. The final draft is due the day of the final exam, and only the grade

on the final draft counts. 20% of the course grade.

The final exam period will be treated as just another class period.

The instructor reserves the right to make adjustments in the above requirements.

COURSE OBJECTIVES:

This course has two major goals which are not unrelated to each other. The first goal is to provide students with conceptual tools to enable them to think critically about the sciences. The second goal is to help students acquire a rich understanding of the nature of science, or at least to understand current controversies about the nature of science. Both goals are important in a society increasingly dominated by science and technology. It is essential that an educated citizenry be able to evaluate and reflect upon the implications of science and technology for our society.

PH 330 NAME_____

CHECKLIST ASSESSMENT FOR AN ARTICLE REVIEW Page no.:_____

The grade of your article review is circled below. The grade on the final draft is the one that matters. The checked items below are to help you improve your rewrite. Attach this sheet to the front of each article review and always turn in your initial draft with the rewritten final draft. The initial draft is due in class the day the article is discussed, and will not be accepted late. The final draft is due one week after being returned by the instructor.

_____Initial draft _____Final draft A B C D F

_____1. You were in class on the day this article was discussed.

_____2. This article review represents your independent efforts.

_____3. You gave an adequate (i.e., detailed, accurate, or complete) description of the main point or conclusion of the article.

_____4. You gave an adequate (i.e., detailed, accurate, or complete) description of the main reasons the author presents in support of the main conclusion.

_____5. You showed clearly enough how the reasons provide support for the main conclusion.

_____6. If the author's intention is descriptive more than argumentative, you clearly outlined the major points in the article.

_____7. You expressed the points of the article in your own words rather than using too many quotes or paraphrases.

_____8. You explained the significance of the article in relation to issues covered in other readings or in class discussions.

_____For the initial draft: This is well done and does not need to be rewritten as a final draft. Good work!

_____For the final rewrite: This is failed because it contains more than an average of 2 departures per page from standard language usage conventions. This includes such areas as: spelling, sentence boundaries (fragments, run-ons), verb forms, pronouns, apostrophes, and sentences which make sense.

Each article review counts as 8% of the course grade.

PH 330 NAME_____

CHECKLIST ASSESSMENT FOR AN ANALYSIS OF A SCIENTIFIC REPORT

The grade of your scientific report analysis is circled below. The grade on the final draft is the one that matters. The checked items below are to help you improve your rewrite. Attach this sheet to the front of each report analysis and always turn in your initial draft with the rewritten final draft. Be sure to include a photocopy of the report for the one you find.

_____Initial draft _____Final draft A B C D F

_____1. You have accurately identified the aspect of the real world that is the focus of study in the case at hand.

_____2. You have adequately described the theoretical model(s) used to represent the real world.

_____3. You have correctly or adequately identified the data that have been obtained by observation or experiment involving the real world objects of study.

_____4. You have accurately identified a prediction, based on the model, that says what data should be obtained if the model actually provides a good fit to the real world.

_____5. You have adequately evaluated the result, if the data do <u>not</u> agree with the prediction.

_____6. You have adequately evaluated the result, if the data <u>do</u> agree with the prediction.

_____7. Your work is the result of independent efforts.

_____<u>For the initial draft:</u> This is well done and does not need to be rewritten as a final draft. Good work!

_____<u>For the report found by the student:</u> The report you've selected does not provide you with sufficient information to make a thorough analysis. You should find another report to analyze.

_____<u>For the final rewrite:</u> This is failed because it contains more than an average of 2 departures per page from standard language usage conventions. This includes such areas as: spelling, sentence boundaries (fragments, run-ons), verb forms, pronouns, apostrophes, and sentences which make sense.

Each report analysis (the four assigned by the instructor and the one found by the student) counts as 8% of the course grade, or a total of 40%.