Perspectives on Science and Math-UTeach

HIS 329U – 39545, 39550, 39555, 39560
Lectures: MWF 11:00 – 12:00, 2:00 – 3:00; 4.18 Painter Hall
Discussion sections: M 12:00 – 1:00; M 3:00 – 4:00; W 12:00 – 1:00; W 3:00 – 4:00

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Office Hours: M 1-2, F 3-4 by app.

Course Description

Perspectives on Science and Math explores the intellectual, social, and cultural history of science and math from the Renaissance to the present. It is designed for students in UTeach Natural Sciences. The course has four interlocking goals: to give you an overview of the history of science and mathematics, for your general education and to help you reflect on your own reasons and goals for teaching science or math; to enable you to put this broader history and context to work in science and mathematics pedagogy; to improve your writing skills to competence or mastery; and likewise to improve you research and information analysis skills to competence of mastery. This is a writing flag class.

The readings and lessons explore the why, how, and what of the history of science and math. We will attempt to identify and analyze the goals of natural philosophers, scientists, and mathematicians—why did they think the knowledge they made was important? We will investigate the practices by which people have established the *credibility* or *authority* of knowledge—how did people agree on what was true? And we will study the content of theories—what did people know? "We" is not a figure of speech here. This is a team taught class, and you are on the team. Nearly a third of the lessons will be developed and led by students. These lessons will focus especially on answering the last question; that is, what did people know?

Assignments and Grading Policies

Links to readings are given in the course's blackboard site under external links or posted under course documents.

Plus/minus grades will be assigned. Unless an extension is granted well in advance, the grade will drop a full letter for each day an assignment is late. "Sundry assignments" will not be accepted late.

Students with disabilities may request appropriate academic accommodations from Services for Students with Disabilities: 471-6259.

University policies on plagiarism and academic dishonesty will be enforced.

Unit Reflections: 15% (5% each)
Two page written reflections on the readings, lectures, and discussions for each of the first three units. Due the Monday after the end of the unit.

Participation: 15%
Attendance will be taken and factored into your grade. One unexcused absence is allowed. In addition, active and insightful engagement in the lessons will be rewarded—everyone is expected to participate in discussions. Attendance and participation in sections is included here.

Sundry Assignments: 10%
These are ungraded or plus-check-minus assignments completed in class or at home. Most are connected to a reading and are designed to improve comprehension and assure that you have completed the reading. They may include unannounced quizzes. The week you present your 5E Lesson, you will not be expected to complete any of these assignments.

5E Lesson Plan: 25%
Working in pairs, you will prepare, present, and revise one 5E Lesson Plan integrating a historical topic into a science or math lesson. These lessons are considered part of the class, and should focus on an interesting or important historical idea or method. The 5E Lesson Plans will be critical for providing the intellectual (as opposed to the social and cultural) history component of the course. Handouts, examples, rubrics, etc. will explain the assignment and establish clear expectations.

Text Book Paper: 25%
The library has compiled a collection of approximately100 historical science and math textbooks, as well as web-links to textbooks, and has a substantial collection of current textbooks in the stacks. This paper asks you to create a sample of these text books and write a 10 page paper analyzing this sample. The paper could explore, for example, the changing treatment of a particular concept over a long period or a single decade; changes in subject areas as reflected in textbooks, changes in pedagogical theory, or changes in the books target audience. This is a scaffolded writing assignment that includes peer review and is designed to model good writing instruction in secondary schools. Due May 6th

Final Exam: 10%
The final exam will consist of two short essays (questions given in advance) and identifications taken from students 5E Lesson Plans. Final Exam for 11-12 class: Monday May 16th, 2:00 – 5:00. Final Exam for 2-3 class: Friday May 13th, 2:00 – 5:00.

Week 1: Introduction
Jan. 19: Who Cares about History?
Assignment: Write a one or two paragraph explanation of why your subject is worth students' time and attention.

Jan. 21: Who Cares about Science or Math?

Unit One: The Word and the World

Week 2: Other Worlds
Jan. 24: Knowledge and Utopia
Reading: Chapter 7 of Plato *The Republic* (Blackboard external links)

Jan. 26: Microcosm and Macrocosm
Reading: Newman, "From Alchemy to Chymistry" in Katherine Park and Lorraine Daston, eds., *The Cambridge History of Science: Early Modern Science* (Cambridge, UK: Cambridge University Press, 2006), 497-517.

Jan. 28: Sample 5E Lesson Plan

Week 3: Challenging Authority
Jan 31: Vesalius: Know Thyself
Reading: Preface and browse images in *De Fabrica* (Blackboard external links)

Feb. 2: Copernicus: Save the Phenomenon
Reading: Begin reading for Friday's class.

Feb. 4: Galileo: Theology, Philosophy, Science
Reading: Stillman Drake, *Galileo* (1980), 1-8, 38-93.

Week 4: "The Scientific Revolution?"
Feb. 7: Asking Nature
Steven Shapin, "How Was it Known: Reading Nature's Book," in *The Scientific Revolution* (Chicago: Chicago University Press, 1998), 65-118.

Feb. 9: Theory vs. Practice
Katherine Hill, "Juglers of Schollers"? Negotiating the Role of a Mathematical Practioner," *BJHS* (Sep. 1998), 253-274.

Feb. 11: 5E Lesson Plans 1

Week 5: The Enlightenment
Feb. 14: The Encyclopédie
Reading: Map of the System of Human Knowledge; Detailed explanation of the System of Human Knowledge; three articles from the Encyclopédie (Blackboard external links)

Feb. 16: The Clockwork Universe?
Reading: Mary Jo Dobbs, "Issac Newton, Philosopher by Fire," in *The Janus Faces of Genius: The Role of Alchemy in Newton's Thought* (Cambridge, UK: Cambridge University Press, 1991), 1-18.

Feb. 18: 5E Lesson Plans 2

Unit Two: Evolution

Week 6: Ordering Diversity
Feb. 21: Exploration, Empire, and Classification
Reading: Browse, Carl von Linné, *A System of Vegetables, according to their classes genera orders, species and differences, volume 1* (Blackboard external links)
Unit One Reflection Due

Feb. 23: Natural Theology
Reading, Paley, *Natural Theology*, chapters 1-4 (Blackboard external links)

Feb. 25: 5E Lesson Plans 3

Week 7: The Struggle for Existence

Feb. 28: The Dismal Science
Thomas Malthus, *An Essay on the Principle of Population* (London, 1798), Chapters 1-5, 7

March 2: The Theory of Natural Selection
Charles Darwin, *The Origin of Species,* Chapters 1 and 3 (Blackboard external links)

March 4: 5E Lesson Plans 4

Week 8: Evolutionary Controversy

March 7: Special guest lecture, Janelle Hedstrom: Textbook history and resources
Reading: Begin reading for Wed.
Begin Working on Textbook Paper

March 9: The Reception of Evolution
Ronald L. Numbers, "Introduction: Darwinism, Creationism, and Intelligent Design" and "The Scopes Trial: History and Legend" in *Darwinism Comes to America* (Cambridge, Mass.: Harvard University Press, 1998), 1-23, 76-92.

March 11: 5E Lesson Plans 5

Week 9: Spring Break

Unit Three: Sorting People

Week 10: Statistics
March 21: Trust in Numbers
Unit two reflection due

March 23: Social Physics and the Invention of the Normal Man
Reading: Adolphe Quetelet, *A Treatise on Man and the Development of His Faculties*, excerpts

March 25: 5E Lesson Plans 6

Week 11: The Meaning of Biological Inequality
Texts selected and justified for Text Book Paper

March 28: Eugenics
Final draft of reflection due

March 30: The Strange History of the Bell Curve
Reading: Unesco, *Statement on Race*

April 1: 5E Lesson Plans 7

Week 12: Classifying People
Abstract and outline of Text Book Paper due

April 4: Intelligence Quotient
Reading: Lewis M. Terman, "The Problem," in *Intelligence Tests and School Reorganization* (New York: World Book Co., 1923), 1-31.

April 6: Making Up People

April 8: 5E Lesson Plans 8

Unit Four: Technoscience, or Big Science

Week 13: Improving Nature

April 11: Balancing the Books: Agricultural Chemistry
Unit Three Reflection due

April 13: Scientific Conservation
Reading: Garrett Hardin, "The Tragedy of the Commons," *Science* 162 (1968), 1243-1248.

April 15: 5E Lesson Plans 9

Week 14: War and Science
Rough Draft of Text Book Paper due

April 18: Big Science: The Manhattan Project
Reading: Lillian Hoddeson, "Mission Change in the Large Laboratory: The Los Alamos Implosion Program, 1943-1945," in Peter Galison and Bruce Hevly, eds., *Big Science: The Growth of Large-Scale Research* (Stanford: Stanford University Press, 1992), 265-289.

April 20: Cold War and Science and Math Education

April 22: 5E Lesson Plans 10

Week 15: Industry and Science
Comments on rough draft of Text Book Paper due

April 25: Code of Life or Biotechnology

April 27: Government Regulation: Smoking Science
Reading: "A Frank Statement to Cigarette Smokers"

April 29: 5E Lesson Plans 11

Week 16: Technoscience and Education

May 2: 5E Lesson Plans 12

May 4: Global Competition and Science Education

May 6: *Final Draft of Text Book Paper due*

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