

SIED 5321 – Science Tools, Standards, Technology and Safety/Ethics

Syllabus – Spring 2016

Though intrinsic value is no criterion for a puzzle, the assured existence of a solution is.

Thomas Kuhn - *The Structure of Scientific Revolutions*

Learn. Unlearn. Relearn.

Cathy Davidson - *Now You See It*

Contact Information

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Required Text and Reading Materials

There are many for this course - approximately a chapter per week, but all are available online for free. In addition to identifying high-quality readings and resources for this course, we have considered student budgetary needs in selecting materials for the course - note that most of the textbooks have a free-to-read online version.

Excerpts and individual chapters from key texts used in the course include:

- *Science for All Americans*. Available online at:
<http://www.project2061.org/publications/sfaa/online/sfaatoc.htm?ql>
- *Science, Evolution, and Creationism*. Available online at:
http://www.nap.edu/catalog.php?record_id=11876
- *The Benchmarks for Science Literacy*. Available online at:
<http://www.project2061.org/publications/bsl/default.htm>
- *The Texas Science Facilities Standards*. Available online at:
<http://www.utdanacenter.org/sciencetoolkit/safety/facilities.php>
- "How Students Learn: Science in the Classroom" by M. Suzanne Donovan and John D. Bransford, editors, *Committee on How People Learn: A Targeted Report for Teachers, National Research Council*. Available online at:
http://books.nap.edu/catalog.php?record_id=11102
- Board on Science Education (BOSE). (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. National Research Council. Washington,

DC: The National Academies Press, 2012. Available online at:

http://www.nap.edu/catalog.php?record_id=13165

- Loucks-Horsley, S., Stiles, K., & Hewson, P. (1996, May). Principles of effective professional development for mathematics and science education: A synthesis of standards (*NISE Brief Vol. 1, No. 1*). Madison: University of Wisconsin–Madison, National Institute for Science Education. Available online at: http://www.wcer.wisc.edu/archive/nise/publications/briefs/nise_brief_vol_1_no_1.pdf
- National Research Council (NRC). (2007). *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering*. Available online at: http://www.nap.edu/catalog.php?record_id=11741

Additional Readings

- Bybee: et al. (2006). *The BSCS 5E Instructional Model: Origins and Effectiveness. A Report Prepared for the Office of Science Education, National Institutes of Health (Appendix D)*. Available online at: http://www.bsccs.org/sites/default/files/_legacy/BSCS_5E_Instructional_Model-Executive_Summary_0.pdf
- DLESE Climate station activity. Available online at: <http://serc.carleton.edu/introgeo/mathstatmodels/examples/XLstats.html>
- Earth Exploration Toolbook. Available online at: <http://serc.carleton.edu/eet/chapters.html>
- Tony Wayne's Roller Coaster Physics e-book. Available online at: <http://vip.vast.org/BOOK/HOME.HTM>
- Brain research and learning differences. Available online at: <http://www.cast.org/teachingeverystudent/ideas/tes/chapter2.cfm>
- CAST UDL Science Writer. Available online at: <http://sciencewriter.cast.org/welcome;jsessionid=29744658F3E4FA11AAD34EA0DD991498>
- The Texas Science Safety Manual. Available online at: <http://www.utdanacenter.org/sciencetoolkit/index.php>
- NSTA Science Safety. Available online at: <http://www.nsta.org/portals/safety.aspx>
- Donovan & Bransford Part III. Available online at: http://www.nap.edu/openbook.php?record_id=11102&page=27
- About Science Netlinks. Available online at: <http://sciencenetlinks.com/>
- (DLESE). Available online at: <http://www.dlese.org/library/index.jsp>
- A History of standards in Texas. *Benchmarks for Science Literacy* Chapter 13. Available online at: <http://www.project2061.org/publications/bsl/online/index.php?chapter=13>
- Chapter 1: A New Conceptual Framework (pages 7-22) of *A Framework for K12 Science Education* Available online at: http://www.nap.edu/catalog.php?record_id=13165

Additional Articles may be posted as links and/or as handouts for students to read prior and will be assigned regularly.

Course Description

This course takes an integrated approach to science and technology within a thematic learning approach that integrates a constructivist methodology for teaching. The learner will develop an understanding of important science teacher resources, basic science education and lab tools, state and national standards for science teaching, curriculum alignment, laboratory and classroom safety, and professional ethics for science educators.

The curriculum consists of carefully selected and designed problems that engage the learner in the process of acquiring critical knowledge, developing proficiency in problem solving, engaging in self-directed learning, and participating in collaborative teams. This curriculum integration process engages students in collaborative research that can be shared in the classroom, across a community or around the globe.

Prerequisites

Admission to UTEP Graduate School

Course Objectives and Standard Alignment

This course is aligned with Texas State Board of Educator Certification "Master Science Teacher Standards" (MST Standards). The MST Standards are available online at the TEA site – [link here](http://tea.texas.gov/Texas_Educators/Preparation_and_Continuing_Education/Approved_Educator_Standards/) – Full URL to copy and paste below:

http://tea.texas.gov/Texas_Educators/Preparation_and_Continuing_Education/Approved_Educator_Standards/

SIED 5321 addresses components in nearly each standard. The standards are listed below and specific elements addressed by this course are included in comments after each standard.

- **Standard I. Content:** The Master Science Teacher knows and understands and is able to mentor the teaching of the Texas Essential Knowledge and Skills (TEKS) in science. *(This course addresses the history of state and national science standards.)*
- **Standard II. History, Nature, and Context of Science:** The Master Science Teacher understands, applies knowledge of, and guides others to understand the historical perspectives of science, the nature of science, and how science interacts with and influences personal and societal decisions. *(This course addresses the history of science education and touches on some aspects of the history of science.)*
- **Standard III. Scientific Inquiry:** The Master Science Teacher understands, applies knowledge of, and guides others to understand processes of scientific inquiry and the role of inquiry in science learning and teaching. *(This course addresses the*

development of inquiry approaches, including controversies over the implementation of inquiry science in the classroom.)

- **Standard IV. Alignment and Integration:** The Master Science Teacher understands, applies knowledge of, and guides others to understand the Texas Essential Knowledge and Skills (TEKS) and the national science standards and knows the importance of vertical alignment of the TEKS and integration of the science disciplines with one another and with other disciplines. *(This course addresses the history of state and national science standards and follows certain strands through grade levels.)*
- **Standard V. Safety:** The Master Science Teacher understands, implements, models, and advocates: safe classroom, field, and laboratory experiences; safe use of equipment and technology; and ethical use of organisms and specimens and guides others to do the same. *(This course addresses classroom laboratory safety in terms of state and national initiatives. In addition it models the use of technology, especially web-technologies, in the science classroom).*
- **Standard VI. Inclusive Instruction:** The Master Science Teacher uses and guides others to use a variety of instructional strategies and resources to meet the diverse needs of all learners. *(This course addresses the role of the science teacher in developing and implementing science content that is delivered equitably to all learners, including traditionally underrepresented groups in science).*

Prior Knowledge and Course Technical Requirement

This is a fully online graduate course in science education. To perform well in this course an individual should be familiar with using the Internet and the World-Wide Web. Students should have access to a modern (preferably Mac OS X, Windows XP or above) computer onto which they may save files and install software. Students should have a fast Internet connection and access to a modern and functional Browser such as Google Chrome, Safari, Internet Explorer 6 and above or Firefox 6 and above with the latest Flash plugin installed (Firefox 11 is recommended). Students will need to have the ability to open and print Adobe Acrobat (PDF) documents, as well as be able to play audio and video. Students should be able to write well and be able to format documents with Microsoft Office Word or a similar word processing software.

The course includes some basic (high school level) physics, life science, Earth science and chemistry content with the expectation that the participant will be familiar with that content. Students should be familiar with the Blackboard learning environment including the use of discussion posts, attaching files, and downloading files. They should be able to name files according to class requirements. Course materials will be delivered using cross-platform file types (JPG, GIF, PPT, PDF, MP3, MP4, HTML, SWF or FLV Flash, Word Doc and RTf format).

Course Procedures

This class is a graduate class in science education, and it is expected that students manage their time and complete all the required classroom material. The class will be facilitated in Blackboard Learn (version 9.1) through the University of Texas at El Paso and can be accessed through the My UTEP 3.0 Web Site (<http://my.utep.edu>) and will be conducted as an online class. All class interactions will be done online and all material for the semester will be delivered and received in Blackboard Learn. Be sure to read all the lecture note materials thoroughly and to continually consult the course schedule in order to keep up on all information associated with this online class.

There will be weekly lecture notes that will be posted no later than Monday morning of each week throughout the semester. The weekly lecture notes will appear as a link in the Weekly module of our class in Blackboard Learn. It is the responsibility of each student to follow this material and integrate it into your individual class material assignments.

Primarily, you will use discussions, quizzes and assignments for turning in material to be graded. An overview of these tools is provided in the class syllabus. Additionally, I would also suggest that you begin to understand the differences between Synchronous and Asynchronous technology tools. Synchronous tools are those that you use in real time, such as chat, instant messaging, telephone conversations or talking to someone face to face. Asynchronous tools are those that have a delay in the delivery of some content and the reception of that content by another person. Tools that fit this are email, discussion boards, quizzes, and assignments in Blackboard Learn, as well as phone messages left on an answering machine.

You will need to examine and understand the environment of your class in Blackboard Learn and the location of all class material. It is recommended that you log in with great regularity in Blackboard Learn to look for email announcement, new content or changes that may come throughout the semester. It is recommended that you try and log into the course at least once a day to make sure you do not miss any important announcements, which will be posted regularly.

Assignments

All online assignments are due by the posted time on the deadline date. Late assignments will not be accepted. Please carefully read all instructions for each assignment. Reading instructions is your responsibility and you should meet all due dates and times.

Individual assignments will be done in the Assignments area and will need to be posted as .docx, .doc or .rtf files. Occasionally, a PowerPoint will be required as well and will need to be submitted in .ppt or .pptx format.

Discussions

For class discussions, you will be communicating in a written format on an assigned topic individually or as a team on a given discussion board. Each team will consist of approximately five to seven people, and each group will include a facilitator. Teams will be assigned by the instructor and cannot be changed. The team will choose its own facilitator and should change the facilitator for each group discussion in order to equitably share this responsibility.

The discussion boards are located within this course. You will need to do the readings and go over the lecture notes to be effective in your responses. Obvious use of acquired content knowledge must be incorporated into discussions. Therefore, participation in discussions will reflect not only in your participation grade, but also in the thoroughness of your assignments.

For each discussion topic, each member should have a minimum of 1 individual response (300 words) to the overarching question and 2 individual postings for feedback (50 words) to other group members' comments. For each group assignment, the team will write a 1-page (single-spaced) report based on the guided questions, which will be posted as a summary to each specific discussion area. The deadlines for discussion postings and replies will be posted online and in the resources section. The facilitator will keep the group on task as well as provide the overall summary by the group at the end of the discussion entries. You must ensure that you meet the deadlines for posting your group assignment.

If there is no assignment submitted there will be no credit given for the posting.

You will be graded your postings according to the following criteria:

- Did you discuss the topic in a thoughtful way?
- Is the argument discussed relevant to class discussion/readings?
- Do you provide relevant evidence that supports your argument?

Grades will be given on an INDIVIDUAL basis for participation in the group discussions; however, the group members will all get the same grade for the final assignment. If, however, it is determined that you did not participate at all in the group discussion, or if your participation is graded as unsatisfactory, you will get a grade of "0" for the group assignment portion of the discussion board.

Do not post your responses to the discussion board as attachments! Please type directly or copy and paste the text into the discussion boards. Assignments can be turned in as attachments.

Quizzes

All online quizzes are due by the posted time on the deadline date. Late quizzes will not be accepted. Please carefully read all instructions for each assignment. Reading instructions is your responsibility and you should meet all due dates and times.

Grading Criteria

The course will be assessed based on the following criteria:

Activity	Percentage of Grade
Quizzes/Discussion/Assignments	60%
Final Project & Online Presentation	30%
Participation	10%
Total	100%

The overall grade for the class for each student will be calculated with the following weights: 60% of points from quizzes, discussions and assignments, 35% Final Product Development/Presentation and 5% on Participation. The Participation Score includes the Syllabus Quiz, Online Class Evaluation and all online interactions within the class. A standard scale will be used in order to determine final grades. The scale is as follows: 90% or above – A, 80% to 89.9% - B, 70% to 79.9% - C, 60% to 69.9% - D, below 60% - F.

Communicating Effectively Online:

When we talk face-to-face, we expect other people to observe certain rules of behavior. The same is true online. Here are a few pointers to help you communicate more effectively via e-mail and discussion boards:

- Clearly summarize the contents of your message in the subject line of your e-mail AND your discussion board postings.
- Avoid using all capital letters. USING ALL CAPS MAKES IT LOOK LIKE YOU'RE SHOUTING! IT'S ALSO MORE DIFFICULT TO READ.
- Avoid using sarcasm in your postings and e-mail messages. Sarcasm does not translate well in the online world. If you have a dry sense of humor, use smilies :) to defuse what could be constituted as an abrupt message (but don't overuse them! :)).
- More information on Netiquette can be found at: www.albion.com/netiquette

Attendance Policy:

Attendance is taken by monitoring your work online. You are responsible for doing all the work and reviewing the online lectures every week. Your participation grade will be dependent in part on your “attendance”.

Assigned Reading Material:

Readings will be assigned for most modules. You will be responsible for reading and understanding these materials. Please use the help board to aid your classmates in these readings

Course Schedule and/or Grading Changes:

The course instructor reserves the right to adjust the course syllabus or change assignments as needed. I will be sure to give you plenty of notice prior to any changes. Remember that the course syllabus and class schedule are living documents and can change.

Technical Assistance:

The University of Texas at El Paso offers complete technical information and help desk support at: <http://admin.utep.edu/Default.aspx?alias=admin.utep.edu/ts>

Guidelines

- **Dates Due – Open** means that a discussion, quiz or written and uploaded assignment is now available.
- **Dates Due – Closed** means that a discussion, quiz or written and uploaded assignment is closed and no longer available.
- **It is important to pay attention to all due dates and to manage your time and meet the requirements of this online graduate class as outlined in the course syllabus.**

Class Calendar – SIED 5321 – Spring 2016

Activities are generally assigned on **Tuesday mornings** and due on **Tuesday evenings** unless noted via a Blackboard notice (E.g.: if there is determined that there is a Blackboard access issue, an assignment date may be adjusted. Do not send any assignments via UTEP email). The course uses a constructivist framework for integrating science, technology and curriculum.

Date	Topics	Online activity	Reading Assignments
Week One	Class Overview Syllabus Review	Exploring Blackboard Discussion 1 – Introductions	<i>Science for All Americans</i> Chapters 1-5
Week Two	Web resources Research on the web and web resources Wikis and Webquests	Syllabus Quiz Discussion 2 - SFAA Assignment 1 – Webquests for Science Education	<i>Science for All Americans</i> , Chapters 6-9, 14 Chapter 1: A New Conceptual Framework
Week Three	History of standards in science education The National standards movement The standards movement in Texas	Quiz 1 - SFAA Discussion 3 - Web Sites Assignment 2 – Webquest Enhancements	<i>Science for All Americans</i> , Chapters 10-13, 15 A History of standards in Texas article <i>Benchmarks for Science Literacy</i> Chapters 1 and 3
Week Four	Task analysis Creating a standards- aligned lesson.	Assignment 3 – History of Standards	About Science Netlinks Digital Library for Earth Science Education (DLESE)

Week Five	Science Pedagogy Constructivism	Assignment 4 – Science Lab Critique	Donovan & Bransford Bybee: et al.
Week Six	Science Safety The Texas Science Safety Manual	Assignment 5 – Science Safety	The Texas Science Safety Manual NSTA Science Safety Texas Science Facilities Standards
Week Seven	Working with special needs populations Problem-based Learning (PBL)	Quiz 2 - Readings to date Assignment 6 – Safety Handout	Loucks-Horsley et al. How Students Learn: Science in the Classroom
Week Eight	Spring Break	Spring Break	Spring Break
Week Nine	Ethical issues in science teaching	Discussion 4 – How People Learn Assignment 7 – Women & Minorities in Science	Beyond Bias and Barriers article Brain research and learning differences Ch. 2
Week Ten	Controversies in science	Quiz 3 - Readings to date Assignment 8 – Science Controversies	Science, Evolution, and Creationism article

Week Eleven	Tools, accessibility, and ethical issues in science teaching	Assignment 9 – Bad Science	A Framework for K-12 Science Education article
Week Twelve	Spreadsheets online and in the classroom E-books and resources	Assignment 10 – Women & Minorities in Science	DLESE Climate station activity Earth Exploration Toolbook Tony Wayne's Roller Coaster Physics e-book
Week Thirteen	Hyperlinking documents	Assignment 11 – Technology Lesson	Work on final project and final presentation
Week Fourteen	Creating a technology-enhanced science lesson	Quiz 4 - Readings to date	Loucks-Horsley et al.
Week Fifteen	Prepare Final Project	Prepare Final Project Course Evaluations	
Week Sixteen	Final Projects Due Online Class Presentations	Final Projects Due Online Class Presentations	

The UTEP Spring 2016 course calendar is available online at the following URL:
<http://academics.utep.edu/Default.aspx?tabid=75507>

HELP Board

The HELP board is a discussion board in this course. This discussion board will have a Frequently Asked Questions (FAQ) list for the class. Students can post messages on any problems you are having with class notes, readings, assignments, tests or technical difficulties.

The subject line in the message must clearly state what you are having a problem with. For example: If you are having a problem with understanding the paper by Atkinson et al, the subject line might say "Reading by Atkinson". This will allow other students to also benefit from your questions. For messages with clear and descriptive subject lines, the instruction team will respond to your posted problem within 24 hours.

Students are strongly encouraged to respond to help messages if you have a solution and help your classmates out. As an incentive, participation points will be given to any students who provide meaningful help to others on the HELP board

Academic Dishonesty

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another person's as ones' own. And, collusion involves collaboration with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. Violations will be taken seriously and will be referred to the Dean of Students Office for possible disciplinary action. Students may be suspended or expelled from UTEP for such actions.

Students with Disabilities

If you have or believe you have a disability, you may wish to self-identify. You can do so by providing documentation to the Office of disabled Student Services located in Union E Room 203. Students who have been designated as disabled must reactivate their standing with the Office of Disabled Student Services on a yearly basis. Failure to report to this office will place a student on the inactive list and nullify benefits received. If you have a condition which may affect your ability to exit safely from the premises in an emergency or which may cause an emergency during class, you are encouraged to discuss this in confidence with the instructor and/or the director of Disabled Student Services. You may call 747-5148 for general information about the Americans with Disabilities Act (ADA).