

STEM-913: Inventions that Changed the World (Great Courses Series)

Independent Study Online Course Syllabus

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Course Description

We're surrounded by inventions. Consider the clocks, appliances, and transportation that coordinate our days. Or the televisions, cell phones, and social media that connect us to each other. And the shopping malls, department stores, and catalogs that define the modern retailing experience. Where did all these inventions come from? How do they work? And how do they reflect—even define—the values of our culture?

From ancient China to 21st-century America, from the English coal mines to the high-tech companies of Silicon Valley, this course takes you around the world and across the ages to show you some of the most innovative moments in human civilization. Assignments address the National Board for Professional Teaching Standards (NBPTS) for Science.

Note: Course guidebook is included with the cost of the course.

Required Texts and Course Materials

Course Guidebook: Carlson, W. B. (2013). Understanding the Inventions That Changed the World. The Teaching Company.

Online Resources: Relevant online resources that support the course content and encourage further investigation will be available throughout the course assignments. Active hyperlinks are utilized throughout the course and will link to the appropriate information when clicked. These include videos, podcasts, worksheets, online activities, journal articles and other resources.

Canvas: This course will be delivered totally online. Canvas is a web-based learning management system (LMS) that provides students access to online resources, documents, videos, assignments, quizzes, forums, etc. Canvas is easy to learn and has a user-friendly interface.

Course Dates

Self-paced; students may enroll at any time and take up to one year, from the date of registration, to complete assignments. Students may complete assignments in no less than three weeks for a 3-unit course (one week per unit).

National Standards Addressed in This Course

National Board for Professional Teaching Standards (NBPTS)

(<http://www.nbpts.org/standards-five-core-propositions/>)

First published in 1989 and updated in 2016, [*What Teachers Should Know and Be Able to Do*](#) articulates the National Board's Five Core Propositions for teaching. The Five Core Propositions - comparable to medicine's Hippocratic Oath — set forth the profession's vision for accomplished teaching. Together, the propositions form the basis of all National Board Standards and the foundation for National Board Certification. Course assignments have been designed so students can demonstrate excellence against these professional teaching standards whenever possible.

- Proposition 1: Teachers are committed to students and their learning
- Proposition 2: Teachers know the subject they teach and how to teach those subjects to students
- Proposition 3: Teachers are responsible for managing and monitoring student learning
- Proposition 4: Teachers think systematically about their practice and learn from experience
- Proposition 5: Teachers are members of learning communities

NBPTS Science Standards (SS-HS)

(<http://www.nbpts.org/wp-content/uploads/EAYA-SCIENCE.pdf>)

The National Board for Professional Teaching Standards (NBPTS) has organized the standards for accomplished teachers of science subjects into the following nine standards. The standards have been ordered to facilitate understanding, not to assign priorities. They each describe an important facet of accomplished teaching; they often occur concurrently because of the seamless quality of accomplished practice. These standards serve as the basis for National Board Certification in science.

NBPTS Science Standards

- Standard I: Understanding Students
- Standard II: Knowledge of Science
- Standard III: Curriculum and Instruction
- Standard IV: Assessment
- Standard V: Learning Environment
- Standard VI: Family and Community Partnerships
- Standard VII: Advancing Professionalism
- Standard VIII: Diversity, Fairness, Equity and Ethics
- Standard IX: Reflection

NBPTS Social Studies – History Standards (SS-HS)

(<http://www.nbpts.org/wp-content/uploads/EAYA-SSH.pdf>)

The National Board for Professional Teaching Standards (NBPTS) has organized the standards for accomplished teachers of social studies–history into the following eight standards. The standards have been ordered to facilitate understanding, not to assign priorities. They each describe an important facet of accomplished teaching; they often occur concurrently because of the seamless quality of accomplished practice. These standards serve as the basis for National Board Certification in social studies–history.

Knowing Students, Purpose, And Content

- Standard I: Knowing Students
- Standard II: Developing Social Understanding, Engagement, and Civic Identity
- Standard III: Content

Teaching in Context

- Standard IV: Instruction
- Standard V: Diversity
- Standard VI: Learning Environments: Classroom and Communities

Developing as a Professional

- Standard VII: Professional Growth
- Standard VIII: Reflection

Common Core State Standards (CCSS) (www.corestandards.org)

The Common Core State Standards provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy.

Continuing Education Student Learning Outcomes (CE-SLO)

CE-SLO 1	Demonstrate proficient written communication by articulating a clear focus, synthesizing arguments, and utilizing standard formats in order to inform and persuade others, and present information applicable to targeted use.
CE-SLO 2	Demonstrate comprehension of content-specific knowledge and the ability to apply it in theoretical, personal, professional, or societal contexts.
CE-SLO 3	Reflect on their personal and professional growth and provide evidence of how such reflection is utilized to manage personal and professional improvement.
CE-SLO 4	Apply critical thinking competencies by generating probing questions, recognizing underlying assumptions, interpreting and evaluating relevant information, and applying their understandings to the professional setting.
CE-SLO 5	Reflect on values that inspire high standards of professional and ethical behavior as they pursue excellence in applying new learning to their chosen field.

CE-SLO 6	Identify information needed in order to fully understand a topic or task, organize that information, identify the best sources of information for a given enquiry, locate and critically evaluate sources, and accurately and effectively share that information.
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Course Student Learning Outcomes (C-SLO)

Student Learning Outcomes for This Course By the end of this course student will be able to:		National Standards Addressed*	CE-SLO Addressed**
C-SLO 1	Describe Inventions that have affected the course of history.	History Standards II, IV, VIII	CE 2, 4
C-SLO 2	Explain major theories developed by inventors.	History Standards III, VII	CE 4, 6
C-SLO 3	Describe the history of common inventions used in everyday life.	History Standards II, VI	CE 1, 2
C-SLO 4	Differentiate between technology and science.	History Standards III, VI	CE 2, 5
C-SLO 5	Describe factors that influence the creation of new inventions.	History Standards II, V	CE 5
C-SLO 6	Distinguish between invention and discovery.	History Standards III, VI	CE 2, 5
C-SLO 7	Analyze the development of scientific thinking.	History Standards III, IV	CE 1, 2, 4
C-SLO 8	Demonstrate ability to create a lesson plan on inventions.	History Standards I, VI	CE 1, 2, 6
C-SLO 9	Create age-appropriate educational activities related to inventions	History Standards I, VI	CE 1, 2, 6

* Please refer to the section on **National Standards Addressed in This Course**

** Please refer to the section on **Continuing Education Student Learning Outcomes**

Topics, Assignments, and Activities

The participant's grade will be determined by the number and quality of modules they choose to complete. Outlined below are the module requirements for each type of unit and grade options.

If working towards the "A letter grade" option:

- Nine modules - Complete all 9 content modules.
- Complete the Knowledge Check for each module.
- Complete the Reflective Forum for each module.
- Complete one (1) Application Choice Assignment for each module.
- All coursework with must receive "A-grade" quality or better.

If working towards the "B letter grade" option:

- Seven modules - Complete 7 of the 9 content modules (any 6 of your choice).
- Complete the Knowledge Check for each module.
- Complete the Reflective Forum for each module.
- Complete one (1) Application Choice Assignment for each module.
- All coursework with must receive "B-grade" quality or better.

Module Title	Module Assignments and Activities	Assignment Credit
Welcome Module	• Welcome Video • Course Syllabus • Introduce Yourself Forum	
Module 1 – Everyday Inventions	• Watch Videos 1, 2, 3, 4 • Read Guidebook Lectures 1, 2, 3, 4 • 1.1 Knowledge Check: Everyday Inventions • 1.2 Reflective Forum: Everyday Inventions • 1.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment
Module 2 – Creating a Stable Society	• Watch Videos 5, 6, 7, 8 • Read Guidebook Lectures 5, 6, 7, 8 • 2.1 Knowledge Check: Creating a Stable Society • 2.2 Reflective Forum: Creating a Stable Society • 2.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment
Module 3 – Tools and Trades	• Watch Videos 9, 10, 11, 12 • Read Guidebook Lectures 9, 10, 11, 12 • 3.1 Knowledge Check: Tools and Trades • 3.2 Reflective Forum: Tools and Trades • 3.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment
Module 4 – Power and Preservation	• Watch Videos 13, 14, 15, 16 • Read Guidebook Lectures 13, 14, 15, 16 • 4.1 Knowledge Check: Power and Preservation • 4.2 Reflective Forum: Power and Preservation • 4.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment
Module 5 – Enhancing Home Life	• Watch Videos 17, 18, 19, 20 • Read Guidebook Lectures 17, 18, 19, 20 • 5.1 Knowledge Check: Enhancing Home Life • 5.2 Reflective Forum: Enhancing Home Life • 5.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment
Module 6 – Health and Happiness	• Watch Videos 21, 22, 23, 24 • Read Guidebook Lectures 21, 22, 23, 24 • 6.1 Knowledge Check: Health and Happiness • 6.2 Reflective Forum: Health and Happiness • 6.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment
Module 7 – Transportation and Communication	• Watch Videos 25, 26, 27, 28 • Read Guidebook Lectures 25, 26, 27, 28 • 7.1 Knowledge Check: Transportation and Comm • 7.2 Reflective Forum: Transportation and Comm • 7.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment
Module 8 – Gadgets	• Watch Videos 29, 30, 31, 32 • Read Guidebook Lectures 29, 30, 31, 32 • 8.1 Knowledge Check: Gadgets • 8.2 Reflective Forum: Gadgets • 8.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment

Module 9 – Connections	• Watch Video 33, 34, 35, 36 • Read Guidebook Lectures 33, 34, 35, 36 • 9.1 Knowledge Check: Connections • 9.2 Reflective Forum: Connections • 9.3 Application: Presentation, Lesson Plan, or Choice	A mark of “Complete” is required for each Assignment
Course Wrap-up – Grading and Evaluation	• Final Reflection Forum • Course Evaluation • Course Completion Checklist • Grade Request / Transcript Request	

Grading Policies, Rubrics, and Requirements for Assignments

Grading Policies

- Assignments will be graded per criteria presented in the course rubrics.
- A = 90-100% and B = 80-89%, (anything below 80% will not receive credit.)
- The discernment between an A or a B letter grade is at the discretion of the instructor based on the quality of work submitted (see course rubrics).
- Coursework falling below a B grade will be returned with further instructions.
- All assignments must be completed to receive a grade and are expected to reflect the quality that teacher-training institutions require of professional educators. If completed assignments do not meet this standard, students will be notified with further instructions from the instructor.

Grading Rubrics

Grade	Percent	Description	Rubric
A	90-100%	Excellent	Meets all course / assignment requirements with significant evidence of subject mastery and demonstration of excellent graduate level professional development scholarship.
B	80-89%	Very Good	Adequately meets criteria for all course/assignment requirements - demonstrates subject competency with very good graduate level professional development scholarship.
NC	Below 80%	Unacceptable	Does not meet the minimum criteria for all course/assignment requirements and demonstrated little, if any, evidence of acceptable graduate level professional development scholarship.

Writing Requirements

- **Superior:** Writing is clear, succinct, and reflects graduate level expectations. Clearly addresses all parts of the writing task. Maintains a consistent point of view and organizational structure. Includes relevant facts, details, and explanations.
- **Standard:** Writing is acceptable with very few mistakes in grammar and spelling. Addresses most parts of the writing task. Maintains a mostly consistent point of view and organizational structure. Includes mostly relevant facts, details, and explanations.
- **Sub-standard:** Writing contains noticeable mistakes in grammar and spelling. Does not address all parts of the writing task. Lacks a consistent point of view and organizational structure. May include marginally relevant facts, details, and explanations.

Lesson Plan Requirements

- **Superior:** Instructional goals and objectives clearly stated. Instructional strategies appropriate for learning outcome(s). Method for assessing student learning and evaluating instruction is clearly delineated and authentic. All materials necessary for student and teacher to complete lesson clearly listed.
- **Standard:** Instructional goals and objectives are stated but are not easy to understand. Some instructional strategies are appropriate for learning outcome(s). Method for assessing student learning and evaluating instruction is present. Most materials necessary for student and teacher to complete lesson are listed.
- **Sub-standard:** Instructional goals and objectives are not stated. Learners cannot tell what is expected of them. Instructional strategies are missing or strategies used are inappropriate. Method for assessing student learning and evaluating instruction is missing. Materials necessary for student and teacher to complete lesson are missing.

Instructor/Student Contact Information

Throughout the course participants will be communicating with the instructor and their classmates on a regular basis using asynchronous discussion forums. Students are provided with instructor contact information in the event they want to make email or phone contact. In addition, students are encouraged to email or phone the instructor at any time. Students will also receive feedback on the required assignments as they are submitted.

Forums

Participation is an important expectation of this course and all online courses. Online discussions promote reflection and analysis while allowing students to appreciate and evaluate positions that others express. While students may not be engaging with the same students throughout this course, they will be expected to offer comments, questions, and replies to the discussion question whenever possible. The faculty role in the discussion forum is that of an observer and facilitator.

Coursework Hours

Based on the Carnegie Unit standard, a unit of graduate credit measures academic credit based on the number of hours the student is engaged in learning. This includes all time spent on the course: reading the textbook, watching videos, listening to audio lessons, researching topics, writing papers, creating projects, developing lesson plans, posting to discussion boards, etc. Coursework offered for FPU Continuing Education graduate credit adheres to 45 hours per semester unit for the 900-level courses. Therefore, a student will spend approximately 135 hours on a typical 3-unit course.

Services for Students with Disabilities

Students with disabilities are eligible for reasonable accommodations in their academic work in all classes. In order to receive assistance, the student with a disability must provide the Academic Support Center with documentation, which describes the specific disability. The documentation must be from a qualified professional in the area of the disability (i.e. psychologist, physician or educational diagnostician). Once documentation is on file, arrangements for reasonable accommodations can be made. For more information and for downloadable forms, please go to <https://www.fresno.edu/departments/disability-access-education>.

Plagiarism and Academic Honesty

All people participating in the educational process at Fresno Pacific University are expected to pursue honesty and integrity in all aspects of their academic work. Academic dishonesty, including plagiarism, will be handled per the procedures set forth in the Fresno Pacific University Catalogue and Handbook - <https://handbook.fresno.edu/graduate/academic-policies>

Technology Requirements

To successfully complete the course requirements, course participants will need Internet access, can send and receive email, know how to manage simple files in a word processing program, and have a basic understanding of the Internet. Please remember that the instructor is not able to offer technical support. If you need technical support, please contact your Internet Service Provider.

Getting Help with Canvas: If you need help with Canvas, please contact the FPU Help Desk by phone: (559) 453-3410 or email: helpdesk@fresno.edu. Help is available Mon-Fri 8:00 am to 7:00 pm.

Final Course Grade and Transcripts

When all work for the course has been completed, students will need to request their final grade by accessing the form at ce.fresno.edu/grade-request. Once the instructor receives the request and posts their final grade, students will receive an email communication from the University. Please allow at least two weeks for the final grade to be posted before you order your transcripts online.

University Policies and Procedures

Students are responsible for becoming familiar with the information presented in the Academic Catalog and for knowing and observing all policies and procedures related to their participation in the university community. A summary of university policies may be found on the university website at <https://www.fresno.edu/departments/registrars-office/academic-catalogs>.

Fresno Pacific University Student Learning Outcomes (FPU-SLO)

FPU-SLO 1	Oral Communication: Students will <i>exhibit</i> clear, engaging, and confident oral communication – in both individual and group settings – and will critically <i>evaluate</i> content and delivery components.
FPU-SLO 2	Written Communication: Students will <i>demonstrate</i> proficient written communication by <i>articulating</i> a clear focus, <i>synthesizing</i> arguments, and utilizing standard formats in order to <i>inform</i> and <i>persuade</i> others.
FPU-SLO 3	Content Knowledge: Students will <i>demonstrate</i> comprehension of content-specific knowledge and the ability to apply it in theoretical, personal, professional, or societal contexts.
FPU-SLO 4	Reflection: Students will <i>reflect</i> on their personal and professional growth and <i>provide evidence</i> of how such reflection is utilized to manage personal and vocational improvement.

FPU-SLO 5	Critical Thinking: Students will <i>apply</i> critical thinking competencies by <i>generating</i> probing questions, <i>recognizing</i> underlying assumptions, <i>interpreting</i> and <i>evaluating</i> relevant information, and <i>applying</i> their understandings to new situations.
FPU-SLO 6	Moral Reasoning: Students will <i>identify</i> and <i>apply</i> moral reasoning and ethical decision-making skills, and <i>articulate</i> the norms and principles underlying a Christian worldview.
FPU-SLO 7	Service: Students will <i>demonstrate</i> service and reconciliation as a way of leadership.
FPU-SLO 8	Cultural and Global Perspective: Students will <i>identify</i> personal, cultural, and global perspectives and will employ these perspectives to <i>evaluate</i> complex systems.
FPU-SLO 9	Quantitative Reasoning: Students will accurately <i>compute</i> calculations and symbolic operations and <i>explain</i> their use in a field of study.
FPU-SLO 10	Information Literacy: Students will <i>identify</i> information needed in order to fully understand a topic or task, <i>explain</i> how that information is organized, <i>identify</i> the best sources of information for a given enquiry, <i>locate</i> and critically <i>evaluate</i> sources, and accurately and effectively <i>share</i> that information.