TEACH SCIENCE - IMPACT THE FUTURE
Why Teach Science?
Click on the image to see a short presentation by Dave, a middle school science teacher. He teaches several grades and covers many science topics, covering things like earth science, living things, astronomy, and more. In this presentation, he is working with sixth graders to investigate electricity.
SCIENCE TEACHERS ARE PART OF THE SCIENTIFIC COMMUNITY

Click on pictures to find out what these teachers are doing!
SCIENCE TEACHERS INFLUENCE THE FUTURE

• Teachers influence the science literacy of the general population, who become voting citizens, leaders, and decision-makers of our society.
• Elementary teachers prepare and influence the students who enter (or don’t enter) high school science classes.
• High school science teachers prepare and influence the students who enter (or don’t enter) university science programs.
• University faculty help prepare and influence future teachers and scientists.
• Future teachers go back to influence students and the cycle continues.
• Thus the future of both science and our society depends on our science teachers.

Adapted from APS Forum on Education
TOP 25 QUESTIONS FACING SCIENCE OVER THE NEXT 25 YEARS

• What Is the Universe Made Of?
• What is the Biological Basis of Consciousness?
• Why Do Humans Have So Few Genes?
• To What Extent Are Genetic Variation and Personal Health Linked?
• Can the Laws of Physics Be Unified?
• How Much Can Human Life Span Be Extended?
• What Controls Organ Regeneration?
• How Can a Skin Cell Become a Nerve Cell?
• How Does a Single Somatic Cell Become a Whole Plant?
• How Does Earth's Interior Work?
• Are We Alone in the Universe?
• How and Where Did Life on Earth Arise?
• What Determines Species Diversity?
• What Genetic Changes Made Us Uniquely Human?
• How Are Memories Stored and Retrieved?
• How Did Cooperative Behavior Evolve?
• How Will Big Pictures Emerge from a Sea of Biological Data?
• How Far Can We Push Chemical Self-Assembly?
• What Are the Limits of Conventional Computing?
• Can We Selectively Shut Off Immune Responses?
• Do Deeper Principles Underlie Quantum Uncertainty and Nonlocality?
• Is an Effective HIV Vaccine Feasible?
• How Hot Will the Greenhouse World Be?
• What Can Replace Cheap Oil -- and When?
• Will Malthus Continue to Be Wrong?

BE A SCIENCE TEACHER
PREPARE THE MINDS THAT DISCOVER THE ANSWERS
See the Top 125 Questions of the 21st Century in Science
http://www.sciencemag.org/sciext/125th/
What are the Steps to Earning a Teaching Credential?
To earn a secondary science teaching credential, candidates must:

- demonstrate subject matter competency and
- complete a program of professional preparation.

The California Commission on Teacher Credentialing authorizes eight different science credentials for teaching in grades 7-12.

- Each credential requires demonstration of subject matter competence through completion of specific undergraduate or graduate degrees OR successful passage of several subtests of the California Science Examination for Teachers (CSET) in Science.
- Candidates with a regular credential in a science area are authorized to teach in their specific discipline as well as general and integrated science, including middle school science.
- Candidates with a Specialized credential in a science area are authorized to teach only in their specific discipline.

The most common route to subject matter competency is a major in a specific discipline and passage of the appropriate CSETs.
# SINGLE SUBJECT CREDENTIALS IN SCIENCE

<table>
<thead>
<tr>
<th>CREDENTIALIAL AREA</th>
<th>COURSES AUTHORIZED TO TEACH</th>
<th>OPTIONS FOR SUBJECT MATTER COMPETENCY</th>
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<tr>
<td><strong>BIOLOGY</strong></td>
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</tr>
<tr>
<td>Biological Sciences (Specialized)</td>
<td>Life Sciences, Anatomy, Botany, Genetics, Physiology, Zoology, Microbiology, Biochemistry/Molecular Biology, Biotechnology, Marine Biology, Ecology, Environmental Science</td>
<td>Graduate Degree in Biology #120 Subtest III Concentration Biology #124 Subtest IV Specialization Biology</td>
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<tr>
<td>Biological Sciences (Regular)</td>
<td>All of the courses listed above for Biological Sciences (Specialized) as well as General Science and Integrated Science.</td>
<td>Subject Matter Preparation Program in Biological Sciences #118 Subtest I General Science #119 Subtest II General Science #120 Subtest III Concentration Biology</td>
</tr>
<tr>
<td><strong>CHEMISTRY</strong></td>
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<tr>
<td>Chemistry (Specialized)</td>
<td>Chemistry, Organic Chemistry, Biochemistry, Quantitative Analysis/Qualitative Analysis, Nuclear Chemistry, Physical Science-Chemistry</td>
<td>Graduate Degree in Chemistry #121 Subtest III Concentration Chemistry #125 Subtest IV Specialization Chemistry</td>
</tr>
<tr>
<td>Chemistry (Regular)</td>
<td>All of the courses listed above for Chemistry (Specialized) as well as General Science and Integrated Science.</td>
<td>Subject Matter Preparation Program in Chemistry #118 Subtest I General Science #119 Subtest II General Science #121 Subtest III Concentration Chemistry</td>
</tr>
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<td><strong>GEOSCIENCES</strong></td>
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<tr>
<td>Geosciences (Regular)</td>
<td>All of the courses listed above for Geosciences (Specialized) as well as General Science and Integrated Science.</td>
<td>Subject Matter Preparation Program in Geosciences #118 Subtest I General Science #119 Subtest II General Science #122 Subtest III Concentration Earth and Planetary Science</td>
</tr>
<tr>
<td><strong>PHYSICS</strong></td>
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</tr>
<tr>
<td>Physics (Specialized)</td>
<td>Physics, Physical Science-Physics</td>
<td>Graduate Degree in Physics #123 Subtest III Concentration Physics #127 Subtest IV Specialization Physics</td>
</tr>
<tr>
<td>Physics (Regular)</td>
<td>All of the courses listed above for Physics (Specialized) as well as General Science and Integrated Science</td>
<td>Subject Matter Preparation Program in Physics #118 Subtest I General Science #119 Subtest II General Science #123 Subtest III Concentration Physics</td>
</tr>
</tbody>
</table>
Adding a science authorization to a multiple subject credential increases employment opportunities!

To add an Introductory Subject Matter Authorization in Science, only coursework is required.
  – Authorizes instruction through 9th grade level
  – Requires completion of 32 semester units of non-remedial course work or a collegiate major in the subject.

To add a single subject authorization (in biological sciences, chemistry, geological science, or physics), you need to
  – demonstrate subject matter competency through passage of the CSETs
  – complete a science methods course (EDSC 542S)
  – This authorizes instruction through grade 12
Why Minor in Natural Science?

• Future teachers gain additional preparation in several science areas while learning about the most important concepts and problems in the sciences.

• The minor readily combines with any major when the student carefully selects the appropriate lower division general education classes. Assuming efficient lower division GE science selections, the minor may require only 9-11 additional units.

• Students who earn the Natural Sciences Minor along with either a Single Subject or Multiple Subject Credential may qualify for the Introductory Subject Matter Authorization with an additional units, depending on how many units they earned while completing the minor.
What the Minor Looks Like

**Lower Division GE (9-11 units):**
- Biology 101 & 101L* or 102*
- Geology 101 & 101L* or 102*
- Chemistry 100 & 101L * or
- Physics 101 & 101L* or
- Chemistry/Physics 102*
  *Includes a lab; must have a biology lab and a lab from either geology, chemistry or physics

**Upper Division Courses (12 units):**
- SCED 410: Physical Science Concepts (3)
- SCED 453: Life Science Concepts (3)
- 6 units from at least two of the following subject areas: Biology, Chemistry, Physics, Geology

**Suggested Upper Division Courses for the Minor:**
- BIOL 300: Environmental Biology
- BIOL 305: Human Heredity, & Genetics
- BIOL 306: Biology of Aging
- BIOL 310: Human Physiology
- BIOL 311: Nutrition & Disease
- BIOL 318: Wildlife Conservation
- BIOL 319: Marine Biology
- BIOL 330: Ecology of American Indians
- BIOL 352: Plants & Life
- BIOL 360: Human Sexuality,
- CHEM 303 A, B, C: Biotechnology & Society
- CHEM 311: Nutrition & Disease
- CHEM 313 A, B, C: Environ Pollution/ Sols
- GEOL 310T: Topics ill CA-Related Geology
- GEOL 420: Earth Science for Science teachers
- PHYS 301: Energy and the Environment
What Science Would You Teach?
WHAT GUIDES SCIENCE INSTRUCTION IN CALIFORNIA?

**California Science Framework**
This is the blueprint for how to teach science, containing information about:

- Education Reform
- Science Instruction and Instructional Materials
- Professional Preparation of Science Teachers

**Science Content Standards**

- California has identified and adopted academic content standards for kindergarten through grade twelve.
- These standards are designed to ensure that all students have a rich experience in science at every grade level and that curriculum, builds on previous learning.
- See these standards by grade level at: [http://www.cde.ca.gov/be/st/ss/scmain.asp](http://www.cde.ca.gov/be/st/ss/scmain.asp)
CA MIDDLE SCHOOL SCIENCE

- **6th Grade:** [Focus on Earth Science](#)
  - Plate Tectonics and Earth’s Structure, Shaping Earth’s Surface, Heat, Energy in the Earth System, Ecology, Resources, Investigation and Experimentation

- **7th Grade:** [Focus on Life Science](#)
  - Cell Biology, Genetics, Evolution, Earth and Life History, Structure and Function in Living Systems, Physical Principles in Living Systems, Investigation and Experimentation

- **8th Grade:** [Focus on Physical Science](#)
  - Forces, Motion, Structure of Matter, Earth in the Solar System, Reactions, Chemistry of Living Systems, Periodic Table, Density and Buoyancy, Investigation and Experimentation
CA HIGH SCHOOL SCIENCE

- **Physics**
  - Motion and Forces, Conservation of Energy and Momentum, Heat and Thermodynamics, Waves, Electric and Magnetic Phenomena, Investigation and Experimentation

- **Chemistry**
  - Atomic and Molecular Structure, Chemical Bonds, Conservation of Matter and Stoichiometry, Gases and Their Properties, Acids and Bases, Solutions, Chemical Thermodynamics, Reaction Rates, Organic Chemistry and Biochemistry, Nuclear Processes, Investigation and Experimentation

- **Biology/Life Sciences**
  - Cell Biology, Genetics, Ecology, Evolution, Physiology, Investigation and Experimentation

- **Earth Sciences**
WHAT SCIENCE DO WE TEACH AND WHY?

Many organizations have an opinion about what science we should teach. For example:

– **Science for All Americans**: The [American Association for the Advancement of Science (AAAS)](https://www.aaas.org) founded Project 2061 in 1985 to help all Americans become literate in science, mathematics, and technology.

– **ACS Education**: The [American Chemical Society](https://www.acs.org) is just one example of subject-specific organizations that offer curriculum and instructional resources for teaching society.

– **NSTA Teacher Resources**: The goal of the [National Science Teachers Association](https://www.nsta.org) is to promote excellence and innovation in science teaching and learning for all.
• **Website for Educators and Students**
• **Curriculum Materials**
• **Student Activities**
• **ACS High School Student Clubs**
  – Your Virtual Chemistry Club
• **Public Service Announcement**

**What's That Stuff?**

These features have appeared in *Chemical and Engineering News*, the weekly newsmagazine published by the American Chemical Society, the world’s largest scientific society.

- Aircraft Engines
- Artificial Snow
- Artificial Sweatshirts
- Azahari
- Baseballs
- 1056
- Kitty Litter
- Longitude
- Lightsticks
- Lipstick

Be a Science Teacher Presentation
Science Education Program

AMERICAN PHYSICS SOCIETY

- Website for Students and Educators
- Color Me Physics Coloring Book
- Physics to Go
Science Education Program

GEOLOGICAL SOCIETY OF AMERICA

• Education and Teacher Resources Website
• Why Earth Science brochure
• Nature of Science and Scientific Method
• Understanding Climate Change presentations and videos
**Resources for Teaching and Learning**

**The Butterfly Project**

**Actionbioscience.org**
There are many things you can do to prepare for a career as a science teacher before you enter the classroom. Whether you are still a student or you are an adult seeking to enter the field, now is the time for you to begin building skills related to teaching, management, and organization.

ADVISEMENT RESOURCES

• Center for Careers in Teaching
  – www.fullerton.edu/cct/

• Science Education Program
  – ed.fullerton.edu/SecEd/Credential_Prog

• Science Education Office (714-278-2703)

• Science Education Program Director
  – Dr. Vikki Costa (vcosta@fullerton.edu)
ADDITIONAL INFORMATION

• Why Teach?
  – http://www.recruitingteachers.org/channels/clearinghouse/whyteach/default1.htm

• I love Teaching
  – http://www.iloveteaching.com - designed to encourage new teachers

• New Teacher.com
  – http://www.new-teacher.com -designed to inspire those considering teaching)

• Occupational Outlook Handbook – Information on Teaching
  – http://stats.bls.gov/oco/ocos069.htm - the site offers extensive information on the nature of teaching, the employment picture, working conditions, and the job outlook

• Career Planning for Teachers
  – http://careerplanning.about.com/library/weekly/aa030901d.htm - describes the nature of teaching

• Status of the American Public School Teacher
YEAR OF SCIENCE 2009

Looking for something to do for 2009?
Year of Science 2009 is all about celebrating science and that celebration can take many forms. If you are looking for something new to add to your activities, try some of these:

Start your own Science Café — Described as "a place where, for the price of a cup of coffee or a glass of wine, anyone can come to explore the latest ideas in science and technology," these cafes provide a forum for engaging the public in science. Held in cafes, bars, or restaurants, informal presentations lead to high energy discussions. Learn more about starting your own café.

Science and the humanities — Encourage collaboration with the arts and humanities community in your area to raise awareness of science. Organize a Science Night at the Improv, an art exhibit, or stage performance that focuses on artistic impressions of science.

Reach Out!

Click on image to go to Website.