



# SUCCESSING IN EARTH SCIENCE

## What do you need to know?

*Learning Earth Science for the elementary school classroom.*

California expects its teachers to have a solid grounding in Earth Science. Earth Science is taught in all elementary grades, and credential candidates must demonstrate mastery of many Earth Science topics.

Fortunately, almost all of these topics are successfully taught in the first seven grades and there are resources to let you know exactly what knowledge is expected of you. The best place to begin reviewing Earth Science is with the “CA Knowledge Standards for the Multiple Subject Teaching Credential.” These are available online at the CSET website:

[http://  
www.cset.nesinc.com/](http://www.cset.nesinc.com/)

There is a lot of information at this site. Use the menu on the left to get to “Subject Matter

Requirements,” and “Multiple Subjects.” The Earth Science standards start on p. 14 and are also included at the end of this handout.

[http://  
www.cset.nesinc.com/  
PDFs/  
CS\\_multisubject\\_SMR.pdf](http://www.cset.nesinc.com/PDFs/CS_multisubject_SMR.pdf)

The site also has the “CSET: Multiple Subjects Practice Test.” Subtest II will really help you get an idea of the sorts of questions asked in “Math and Science.”

[http://  
www.cset.nesinc.com/  
CS\\_viewPT\\_opener.asp](http://www.cset.nesinc.com/CS_viewPT_opener.asp)

Finally, this CA Dept. of Education website that has a lot of useful information as you start your career: [http://  
www.cde.ca.gov/pd/bt/gc/](http://www.cde.ca.gov/pd/bt/gc/)

## How do you learn all that?

*Study tips for learning material outside your main area*

You do not learn to play a symphony by reading through the sheet music once—only by repeatedly practicing the music, and by spending extra time on the difficult parts. Learning any difficult subject can be treated the same way. Reading the book and going to lectures are both fine introductions, but to master

the material, you really need to work with it repeatedly from many different angles. Here are suggestions for different ways to work through unfamiliar material.

### *Read the book*

Reading can be a surprisingly passive activity. To actually engage your mind while

### Earth Observatory

Another fun way to learn about our Earth is by email. NASA sends out a weekly email with links to the latest images from space relating to items in the news. Check out the links below, and if it seems entertaining, there's a link on the bottom of each web page where you can subscribe. It's free, and they won't give your email address to anyone else.

After all, you've already paid for the science with your tax dollars – why not enjoy the pretty pictures? (At the web page below click on “example” and then on any of the “latest images,” or just fill in your email address and subscribe.)

[http://  
earthobservatory.nasa.g  
ov/subscribe.php3](http://earthobservatory.nasa.gov/subscribe.php3)



Hurricane Dean Approaches Yucatan Peninsula, 8/20/2007

reading, take notes. As you read, write down the main point of each paragraph, or at least each section of the chapter. Underline important phrases and passages. Just the act of underlining forces your brain to engage more fully with what you are reading—



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so you will retain more.

## *Make study guides*

The best study guide is one you make yourself by rewriting and condensing your notes from lecture and from the reading. Many students benefit from making flash cards or information maps or other visual display of the main topics from each chapter / lecture. There are a number of good ideas for this sort of activity at [www.studygs.net](http://www.studygs.net), [www.studytips.org](http://www.studytips.org) and even more at [www.how-to-study.com](http://www.how-to-study.com)

## *Class Notes*

After class, go over your notes. This will help you retain what you just learned. It is a good idea to read them out loud—are there parts that don't make sense as written? Check in the book, with a classmate, or with the professor to get those parts cleared up right away. Relate the notes to what you have already learned in the class. It is very good practice to rewrite your notes, trying to reorganize them so that the main ideas are clear. Review the notes again before going to class—this will help prepare your brain to absorb new material.

## *Study Groups*

Study groups are great. They make studying more fun, provide a number of different heads to help make sense of the difficult stuff, and your study partners may help you remember important information that you might otherwise forget. Most importantly, even study partners who don't know any of the material provide you with the best learning opportunity of all, which

is to...

## *Teach It!*

There is no substitute for teaching the material to let you know how fully you understand the topic. If your study partners are on the ball they should be able to help correct you if you start teaching that the moon is made of green cheese, for example. If your study partners are very unprepared in a subject area you may have to try explaining it two or three different ways. This is excellent! It forces you to work with the subject matter in multiple different ways—you will learn better, and it is excellent practice for the classroom.

## *Take practice tests*

Take the CSET practice test, but then spend some time taking other practice tests as well. There are review questions at the end of each chapter of almost every Earth Science text book. (Tarbuck and Lutgens, *Earth Science*, and Christopherson, *Geosystems*, are two of many good texts.) You can also create your own practice test with a study partner by having him/her turn a sentence from the State Standards into a question, which you answer, and vice versa. This can work even better with the California Curriculum Frameworks. The Frameworks are written for each grade level, and they provide paragraphs of detail for each part of the standards to help teachers in lesson planning. The fifth, sixth and seventh grade frameworks cover almost all the Earth Science material on the CSET.

<http://www.cde.ca.gov/ci/cr/cf/allfwks.asp>

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THESE ARE THE CALIFORNIA EARTH SCIENCE KNOWLEDGE STANDARDS FOR MULTIPLE SUBJECT TEACHING CREDENTIALS

## **Earth and Space Science**

**3.1 The Solar System and the Universe (Astronomy).** Candidates for Multiple Subject Teaching Credentials identify and describe the planets, their motion, and that of other planetary bodies (e.g.,



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comets and asteroids) around the sun. They explain time zones in terms of longitude and the rotation of the earth, and understand the reasons for changes in the observed position of the sun and moon in the sky during the course of the day and from season to season. They name and describe bodies in the universe including the sun, stars, and galaxies.

**3.2 The Structure and Composition of the Earth (Geology).** Candidates for Multiple Subject Teaching Credentials describe the formation and observable physical characteristics of minerals (e.g., quartz, calcite, hornblende, mica, and common ore minerals) and different types of rocks (e.g., sedimentary, igneous, and metamorphic). They identify characteristics of landforms, such as mountains, rivers, deserts, and oceans. They explain chemical and physical weathering, erosion, deposition, and other rock forming and soil changing processes and the formation and properties of different types of soils and rocks. They describe layers of the earth (crust, lithosphere, mantle, and core) and plate tectonics, including its convective source. They explain how mountains are created and why volcanoes and earthquakes occur, and describe their mechanisms and effects. They know the commonly cited evidence supporting the theory of plate tectonics. They identify factors influencing the location and intensity of earthquakes. They describe the effects of plate tectonic motion over time on climate, geography, and distribution of organisms, as well as more general changes on the earth over geologic time as evidenced in landforms and the rock and fossil records, including plant and animal extinction.

**3.3 The Earth's Atmosphere (Meteorology).** Candidates for Multiple Subject Teaching Credentials explain the influence and role of the sun and oceans in weather and climate and the role of the water cycle. They describe causes and effects of air movements and ocean currents (based on convection of air and water) on daily and

seasonal weather and on climate.

**3.4 The Earth's Water (Oceanography).**

Candidates for Multiple Subject Teaching Credentials compare the characteristics of bodies of water, such as rivers, lakes, oceans, and estuaries. They describe tides and explain the mechanisms causing and modifying them, such as the gravitational attraction of the moon, sun, and coastal topography.

## **Part II: Subject Matter Skills and Abilities Applicable to the Content Domains in Science**

Candidates for Multiple Subject Teaching Credentials know how to plan and conduct a scientific investigation to test a hypothesis. They apply principles of experimental design, including formulation of testable questions and hypotheses, and evaluation of the accuracy and reproducibility of data. They distinguish between dependent and independent variables and controlled parameters, and between linear and nonlinear relationships on a graph of data. They use scientific vocabulary appropriately (e.g., observation, organization, experimentation, inference, prediction, evidence, opinion, hypothesis, theory, and law). They can select and use a variety of scientific tools (e.g., microscopes) and know how to record length, mass, and volume measurements using the metric system. They interpret results of experiments and interpret events by sequence and time (e.g., relative age of rocks, phases of the moon) from evidence of natural phenomena. They can communicate the steps in an investigation, record data, and interpret and analyze numerical and non-numerical results using charts, maps, tables, models, graphs, and labeled diagrams. They make appropriate use of print and electronic resources, including the World Wide Web, in preparing for an investigative activity. Candidates communicate the steps and results of a scientific investigation in both verbal and written formats.