

College of Micronesia – FSM  
P.O. Box 159  
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**Course Outline Cover Page**

Science for Teachers  
**Course Title**

SC/ED 100a  
**Department and Number**

**Course Description:** This one-semester course covers basic knowledge of topics and contents in the Chuuk State Department of Education’s science curriculum framework (Grades 1-8) in order to increase information background of students (pre-service teachers) in elementary-school science (as shown in the chart on page 2). At the same time, it is intended to help students develop and demonstrate both science methodology and science teaching methods and skills in Space Science, Earth Science, Physical Science, Human Science, and Life Science.

Course Prepared by: Alton Higashi, Chairman, Social Science Department State: Chuuk

	Hrs./Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3 x	16	= 48	3
Laboratory	n/a			
Workshop	n/a			
<b><u>Total Semester Credits</u></b>				<b><u>3</u></b>

Purpose of Course: Degree Requirement     x     (one of five state requirements)  
Degree Elective \_\_\_\_\_  
Certificate \_\_\_\_\_  
Remedial \_\_\_\_\_  
Other (workshop) \_\_\_\_\_

Prerequisites: Admission in the A.S. Degree Program for Teacher Education at the COM-FSM Chuuk Campus

\_\_\_\_\_  
Signature, Chairperson, Curriculum Committee

\_\_\_\_\_  
Date Approved by Committee

\_\_\_\_\_  
Signature, President, COM-FSM

\_\_\_\_\_  
Date Approved by President

**TOPIC BREAKDOWN ACROSS THE GRADE LEVELS**

GRADE LEVEL	HUMAN SCIENCE	LIFE SCIENCE	EARTH SCIENCE	SPACE SCIENCE	SCIENCE AND TECH.	ENVIRON. SCIENCE	PHYSICAL SCIENCE
1	Our body — how it is built	Living things around the home and school	Rocks around here	Our friends in the sky	Making direct use of things around us	Effects of clearing a piece of land	Measuring things
2	Our senses	Living things in the forest	Soil, mud and sand	More about the sun	Making use of solid materials	Caring for our forests and soil	What is energy?
3	Processing our food (digestion)	Living things of reef and swamp	Water, water everywhere	More about the moon	Food that come in packages	Caring for our swamps and reefs	Three states of matter
4	Breathing and urinating	Living things in the sea and freshwater	Water on the move	Movements of sun, moon and earth	Making and using electricity	Caring for our water	Magnets, electric charge and gravity
5	Our heart, blood and circulation systems	How we classify living things	The air everywhere	The solar system	Getting extra heat energy	Caring for our air	Burning
6	Our bones, muscles, and nerves	Microbes	Weather	The night sky	Using lens instruments	Disposing of our trash	Rusting
7	Reproducing ourselves	Cells and how living things reproduce	Volcanoes and formation of our islands	The Milky Way and other galaxies	Machines that move people around	Disposing of old machinery	Moving, floating, flying
8	Genetic inheritance	The balance of nature	The changing earth	The changing universe	Machines that send messages	Problems facing the world	Rays — helpful but dangerous

**PROGRAM LEARNING OUTCOMES (PLOs)**

Source: COM-FSM General Catalog 2005-2007 (page 53)

- (01) Demonstrate mastery of the content of the elementary school curriculum
- (02) Develop basic elementary school curriculum
- (03) Demonstrate delivery of elementary school curriculum
- (04) Use (demonstrate) delivery of elementary school curriculum\*
- (05) Assess and evaluate elementary school student learning at both the formative and summative levels\*
- (06) Organize and manage a classroom environment for learning\*
- (07) Demonstrate and use background knowledge in learning theories and principles
- (08) Demonstrate and use background knowledge in human development
- (09) Demonstrate and use background knowledge in technology\*
- (10) Demonstrate and use background knowledge in educational foundations
- (11) Demonstrate and use background knowledge in natural/physical science
- (12) Demonstrate and use background knowledge in the demonstration of professionalism\*

[NOTE: (\*) = This course does not focus on PLO(4), PLO(5), PLO(6), PLO(9), and PLO(12).]

**OVERVIEW OF COURSE LEARNING OUTCOMES (CLOs)**

- (01) Curriculum Development: The student will be able to (TSWBAT)
  - understand and apply basic knowledge, methods, and skills of the Chuuk State Department of Education’s science curriculum framework, Grades 1-8, for Space Science, Earth Science, Physical Science, Environmental Science, Technology and Science, Life Science, and Human Science. → PLO(1), PLO(2), and PLO(3)
- (02) Instructional Programming: TSWBAT
  - demonstrate strategies in scientific methodology and in science teaching in Chuuk’s elementary schools.
  - design and develop daily lesson plans for a teaching unit in science education. → PLO(7), PLO(8), PLO(10), and PLO(11)

**CLO/SLO ASSESSMENT MATRIX**

(op) = organizational pattern, and (tm) = thinking map

SLO	CLO(1)	CLO(2)a	CLO(2)b	Reference
(01)	I			CSDOE science curriculum framework
(02)	I			time order (op)
(03)	I	I	D	charts and diagrams (tm)
(04)	I	I	D	charts and diagrams (tm)
(05)	I	I	D,M	cause-and-effect (op)
(06)	I	I	D	flow chart (tm)
(07)	I	I	D	hand-out
(08)	I	I	D	compare-and-contrast (tm)
(09)	I			simple listing (op)
(10)	I			simple listing (op)
(11)	I			charts and diagrams (tm)
(12)	I			Bloom’s taxonomy (evaluation)
(13)	I	I	I,D,M	CSDOE lesson-plan T-format
(14)	I	I	I,D,M	CSDOE lesson-plan T-format

[NOTE: I = introduced, D = demonstrated, and M = mastered]

**STUDENT LEARNING OUTCOMES (SLOs): TSWBAT**

- (01) Identify and describe at least three strengths and three weaknesses in the CSDOE’s science curriculum framework, for any one specific grade level (Grades 1-8)**

Assessment: production of a chart with simple listing of strengths and weaknesses, such as:

PE	Strengths	PE	Weaknesses
(1)		(1)	
Reason:		Reason:	
(2)		(2)	
Reason:		Reason:	
(3)		(3)	
Reason:		Reason:	

[Note: PE = student performance expectation in the curriculum framework, by grade level and by listed number, such as PE 6.3 (Grade 6, 3rd PE listed).]

to be evaluated by an analytic rubric with three criteria – number of strengths, number of weaknesses, specificity and accuracy of reasons.

- (02) Identify and describe the three phases of science development in the history of science of the past 2,500 years**

Assessment: production of a standard timeline of major events, to be evaluated by an analytic rubric with four criteria – inclusion of all major events, accuracy of sequence, visual design and creativity, and use of graphics to exemplify events

- (03) Draw and explain, step by step, a series of appropriate diagrams (schematics) to illustrate at least one of the following:**

- earth’s revolution and seasonal changes around the sun,
- earth’s rotation on its axis and the correlated day/night change,
- lunar phases in Chuukese culture (30 different names), and
- high and low tides

Assessment: entry in a three-hole binder/journal (or toolkit), to be evaluated by an analytic rubric with three criteria – precision in drawing, correctness in use of labels, and use of CSDOE lesson-plan format (as shown on page 8)

[NOTE: This is a group activity through cooperative learning and project-based learning. Each group selects one of the four themes (bullets) and applies the rubric to produce a unit lesson plan. Upon review and approval by instructor, the final unit plan by each group is xeroxed and distributed to other groups for inclusion in the binder/journal.]

- (04) Draw and explain the various layers of earth’s atmosphere**

Assessment: entry in a three-hole binder/journal, to be evaluated by an analytic rubric with three criteria – precision in drawing, correctness in use of labels, and use of CSDOE lesson-plan format

[NOTE: Each student does his/her own independent work.]

- (05) Draw and explain various cloud formations and observe their frequency over a 3.5-week period**

Assessment: same as SLO(04) above

[NOTE: Each student does his/her own independent work.]

**(06) Draw and explain a flow chart to illustrate cause-and-effect in global warming**

Assessment: production of a flow chart, to be evaluated by an analytic rubric with five criteria – number of cause-and-effect boxes, correctness in labeling, accuracy of sequence, visual design and creativity, and use of CSDOE lesson-plan format

[NOTE: This is a group activity through cooperative learning and project-based learning. Each group applies the rubric to produce a unit lesson plan. Upon review and approval by instructor, the final unit plan by each group is xeroxed and distributed to the group's members for inclusion in their binders/journals. A sample of the flow chart (as shown on page 10) is not to be given to students.]

**(07) Explain, step by step, a series of appropriate diagrams to illustrate both of the following:**

- the chronological and geological history of plate tectonics, and
- the various types of plate tectonics

Assessment: tests (multiple-choice, fill-in-the-blanks, matching, true-and-false, cloze test, and paragraph-writing) that measure knowledge acquisition and broad comprehension; and a unit lesson plan (based on the CSDOE lesson-plan format)

[NOTE: Students will receive a 33-page hand-out on plate tectonics.]

**(08) Draw and explain appropriate thinking maps to match each of the following:**

- matter and energy,
- three states of matter, and
- elements and compounds

Assessment: production of thinking maps, to be evaluated by an analytic rubric with three criteria – appropriate selection of thinking maps, accuracy of information, correctness in labeling; and the use of the organizational pattern of simple listing that compares and contrasts information

[NOTE: David Hyerle's thinking maps are shown on page 11.]

**(09) Explain the atomic theory as an example of theory-building**

Assessment: entry of a pictorial essay in a three-hole binder/journal, to be evaluated by an analytic rubric with four criteria – historical accuracy, organizational pattern of simple listing, proper sequence in construction of theory, and use of visual aids

[NOTE: This is a group activity through cooperative learning and project-based learning through Internet research. Each group applies the rubric to write the essay. Upon review and approval by instructor, the final essay by each group is xeroxed and distributed to the group's members for inclusion in their binders/journals.]

**(10) Explain all major factors in human genetic inheritance**

Assessment: tests (multiple-choice, fill-in-the-blanks, matching, true-and-false, cloze test, and paragraph-writing) that measure knowledge acquisition and broad comprehension

[NOTE: Students will receive a hand-out on human genetic inheritance.]

**(11) Explain at least one of the following body functions and systems:**

- circulatory system,
- digestive system,
- nervous system,
- muscle and bone system,
- respiratory system,
- endocrine, lymphatic, and immune systems,
- reproductive system, and
- urinary system

Assessment: entry of a pictorial essay in a three-hole binder/journal, to be evaluated by an analytic rubric with three criteria – comprehensive illustration of structure of a system, correctness of labeling, and comprehensive narrative of function of the system

[NOTE: This is a group activity through cooperative learning and project-based learning. Each group selects one of the four themes (bullets) and applies the rubric to produce a pictorial essay. Upon review and approval by instructor, the final essay by each group is xeroxed and distributed to other groups for inclusion in the binder/journal.]

**(12) Express a viewpoint, using Bloom’s evaluation level, on one of two problems and issues:**

- stem-cell research, and
- cloning

Assessment: an opinion essay, not more than three pages, to be evaluated by an analytic rubric with several criteria, including rubric criteria used in assessing essays in ESL 099 (Writing V) as well as the following: accuracy of information, use of internal standards for judgment, and use of external standards for judgment

[NOTE: Each student does his/her own independent writing. After two rewritings (first editing based on Bloom’s taxonomy, and second editing based on ESL 099 rubric), each student reviews and selects two other essays written by classmates, to be xeroxed for inclusion in binder/journal.]

**(13) Design and develop at least 10 daily lesson plans on a topic in science education (as shown in “Topic Breakdown Across the Grade Levels” on page 2)**

Assessment: production of a unit lesson plan (to include a minimum of 10 daily lesson plans) using the CSDOE lesson-plan format (as shown on page 8), to be evaluated by a Likert-scale checklist on “structure of lesson plan” used by CSDOE curriculum specialists

[NOTE: SLO(13) focuses on the first four rows of the CSDOE lesson-plan format – from “subject” to “Instructional Methods”. SLO(14) focuses on “teaching/learning activities”.]

[NOTE: The scale includes: 1 = unsatisfactory, 2 = satisfactory, and 3 = excellent. The minimum passing is a mean of 2.0.]

[NOTE: Each student does his/her own independent writing.]

**(14) Incorporate into the 10 daily lesson plans various science teaching methods and skills, including procedures or steps for all of the following:**

- student use of strategies in rote memorization;
- student participation in cooperative learning;
- student use of multiple intelligences;
- student activities in deductive thinking, inductive thinking, and experimentation;
- student activities in dialogical thinking, evaluative thinking, hierarchical thinking, and systems dynamics thinking; and
- student activities in note-taking, math data collection, and recording

Assessment: production of a unit lesson plan (to include a minimum of 10 daily lesson plans) using the CSDOE lesson-plan format (as shown on page 8), to be evaluated by a second Likert-scale checklist on “content of teaching/learning activities” (to be developed by SC 100a instructor based on the six bullets above)

[NOTE: The scale will include: 1 = unsatisfactory, 2 = satisfactory, 3 = good, 4 = very good, and 5 = excellent. The minimum passing is a mean of 3.0.]

[NOTE: Each student does his/her own independent writing. After two rewritings (first editing based on completeness of activities for the six bullets, and second editing based on quality of activities for the six bullets), each student reviews and selects a number of other unit plans written by classmates, to be xeroxed for inclusion in binder/journal.]

## **SPECIAL NOTE**

- English Language Arts: Reference to note-taking, journal writing, and essay writing includes, but is not limited to, the following:
  - ⇒ outline of main ideas, identification of supporting details, summarizing and paraphrasing, and development of response questions, as evidenced by four criteria (pattern of organization and structure, completeness, grammar usage, and spelling),
  - ⇒ statement of basic goals of scientific knowledge, instrumental skills, step-by-step procedures required, scientific attitude development, appreciation of science, and formation of habits of mind, as evidenced by four criteria (topical organization and structure, use of supporting details, cultural relevance, and grade-level appropriateness).
- Scientific Methodology: Task analysis includes, but is not limited to, the following:
  - ⇒ science vocabulary, facts, concepts, principles, and generalizations;
  - ⇒ formulas for problem-solving, drawing and reading tables, graphs, and charts;
  - ⇒ use of basic scientific equipment to measure facts;
  - ⇒ observation and data-recording, classification, cause-and-effect and time-space inference, setting up step-by-step procedures, conducting scientific experiments, hypothesis and theory-building, drawing valid conclusions, and communication; and
  - ⇒ application and evaluation of lessons in the context of the Chuukese culture.
- Lesson Planning: Education courses at COM-FSM Chuuk Campus routinely use the CSDOE lesson-plan T-format to teach pre-service teachers; however, the CSDOE's Reading Success Network (RSN) has introduced a new format that is under review by CSDOE personnel, and it may replace the T-format or serve as an optional format for classroom teachers' use. The RSN uses SIOP (Sheltered Instruction Observation Protocol), as shown on page 9.

**DAILY LESSON PLAN FORMAT (CSDOE)**

Subject: \_\_\_\_\_ | Grade: \_\_\_\_\_ | Day: M T W Th F | Date: \_\_\_/\_\_\_/\_\_\_

Curr. Framework | General  
PE No. | Description

Specific Objective(s):

(1)

(2)

Resource Materials  
Needed:

Instructional  
Method(s):

**TEACHING ACTIVITIES (FOR TEACHER)**

**LEARNING ACTIVITIES (FOR STUDENTS)**

(1) Ice-Breaker:

(1)

(2)

(2)

(3)

(3)

(4)

(4)

(5)

(5)

(6)

(6)

(7)

(7)

(8)

(8)

(9)

(9)

(10) Closure:

(10)

Assessment

Follow-Up Activities (including Practice)





Flow Chart on Global Warming (page 10)

Hyerle's Thinking Maps (page 11)

Course Contents (page 12)

**Methods of Instruction:**

Lectures, group work, group discussions, hand-out readings, assignments (both in-class and take-home), rubrics, and demonstrations that conform to KMSDP organization.

**Required Textbooks:** Science by the Grade (Grades 1-8), and Graphic Organizers, both from Harcourt International (published 2007).

**Supplementary Materials:**

Chuuk State Department of Education's official science curriculum framework (Grades 1-8)  
Hand-Outs

**Reference Materials:**

- Instructor Magazine (library reference, monthly during the school year): science articles and science classroom demonstration and project activities.
- Teaching K-8 Magazine (library reference, monthly during the school year): science articles and science classroom demonstration and project activities.
- General Internet Resource: "Science Lesson Plans" = [www.coled.org/cur/science.html](http://www.coled.org/cur/science.html)
- General Internet Resource: "The Lesson Plans Page" = [www.lessonplanspage.com/](http://www.lessonplanspage.com/)
- Specific Internet Resource: <http://www.pbs.org/teachers/>
- Specific Internet Resource: [www.cloudnet.com/~edrbsass/edsci.htm](http://www.cloudnet.com/~edrbsass/edsci.htm)
- Plus about 39,400 more Internet websites under "science lesson plans" "elementary"

**Evaluation:**

First, assessment of student performance and achievement includes, but is not limited to, the following: in-class assignments, homework, in-class quizzes and tests, take-home exams, a mid-term exam, a final exam, contribution to group production of teacher guide, and general classroom participation. Students will be graded on an academic standard using established letter grades of A, B, C, D and F.

Second, recommendation for advancement into the A.S. degree program will be based on letter grades: full recommendation with C or higher, probationary consideration with D, no recommendation with F.

**Credit by Examination:** None.

**Attendance Policy:** All rules, regulations, and policies regarding attendance policy at COM-FSM apply.

**Academic Honesty:** All rules, regulations, and policies regarding academic honesty at COM-FSM apply.