

ED-CIFS 404 TEACHING SECONDARY SCHOOL SCIENCE

Fall 2009, 3 credits, Tuesday 6:00-9:00 PM, E224

Required Text:

Teaching Secondary School Science. 9th (2008). Bybee, Carlson Powell & Trowbridge.
Pearson/Merrill/Prentice Hall: Upper Saddle River, NJ.

Recommended Text:

National Science Education Standards (1996). National Research Council. National Academy Press:
Washington, DC.
Also available at <http://www.nap.edu/readingroom/books/nses/html/contents.html>

This course is designed to help you examine the perspectives, philosophies, theories, methods and materials for teaching science effectively for all students in grades 7-12 as you become a reflective practitioner. Short and long range planning, assessment of student achievement, instructional applications of technology and other instructional strategies, especially those promoting success for all types of students, will also be emphasized. Techniques for promoting inquiry and discovery, including necessary safety measures and management concerns, will also be investigated. Course activities will provide a basis for the development of competent professional science educators, including familiarity with relevant journals and other sources of instructional aid or information. Course information is also available at: <http://education.boisestate.edu/tsingletary>

To successfully compete this course you will be able to competently complete the following activities *.

- ◆ **Consistently demonstrate commitment to the teaching profession and the appropriate education of children.**
 - * *The teacher recognizes the importance of critical thinking and self-directed learning.* [Core S9-D2]
 - * *The teacher has enthusiasm for learning and the discipline taught.* [Core S9-D6]
 - * *The teacher embraces life-long learning.* [Core S9-D7]
- ◆ **Design a Course Overview for a science course taught in grades 7-12 that is consistent with a national, state or local science framework and philosophy.**
 - * *The teacher understands the Idaho Student Achievement Standards in his/her discipline(s).*
 - * *The teacher understands the role of the discipline in preparing students for the global community of the future.* [Core S1-K1]
 - * *The teacher understands concepts, assumptions, debates, processes of inquiry and ways of knowing that are central to the discipline taught.* [Core S1-K2]
 - * *The teacher appreciates the development of students' abilities to problem solve and think critically about science.* [Science S2-D1]
- ◆ **Prepare a properly written daily lesson plan for a single inquiry or discovery lesson appropriate for a course in your field following directions given in class and the text.**
 - * *The teacher understands the Idaho Student Achievement Standards in his/her discipline(s).* [Core S1-K1]
 - * *The teacher understands best practices for effective instruction.* [Core S1-K5]
 - * *The teacher understands how to apply knowledge about learning theory, subject matter, curriculum development, and child and adolescent development to meet curriculum goals.* [Core S7-K1]
 - * *The teacher understands the process of scientific inquiry.* [Science S1-K5]
 - * *The teacher knows how to investigate scientific phenomena, interpret findings, and communicate information to students.* [Science S1-K6]
 - * *The teacher knows how students construct scientific knowledge and develop scientific habits of the mind.* [Science S2-K1]
 - * *The teacher knows strategies to develop students' laboratory and field skills.* [Science S12-K2]
- ◆ **Demonstrate technological literacy through the use of a computer for writing, communication and applications of instructional technology.**
 - * *The teacher understands basic technology operations and concepts.* [Core S1-K6]
 - * *The teacher knows how to use interfaced electronic hardware and software.* [Science S6-K1]

* Selected Idaho Standards for Initial Certification of Professional School Personnel shown.

- ◆ **Analyze issues of current interest in science education in terms of logical consistency, conceptual accuracy and practical application and reflects on science lessons through analysis of the lesson's curricular goals and objectives, materials and safety, instructional strategies and evidence of student learning.**
 - * *The teacher is committed to continuous learning to stay abreast of new ideas and perspectives in the field. [Core S1-D2]*
 - * *The teacher is committed to ongoing reflection, assessment, and learning as a process. [Core S9-D2]*
 - * *The teacher is aware of legal responsibilities associated with safety. [S11-K4]*
- ◆ **Plan a sequence of five to ten lessons designed to develop one or two concepts and/or skill(s) that fit within specific goals and objectives for a course in your field, incorporates appropriate activities and applications of technology and includes suggestions for adapting instruction to encourage success for all learners.**
 - * *The teacher understands and knows how to identify differences in approaches to learning and performance (e.g. learning styles, multiple intelligences, and performance modes) and designs instruction that helps use students' strengths as a basis for growth. [Core S3-K1]*
 - * *The teacher knows how to effectively communicate and reinforce science concepts and principles through lessons, demonstrations, and laboratory activities. [Science S1-K7]*
 - * *The teacher knows commonly held conceptions about science and how they affect student learning. [Science S2-K2]*
 - * *The teacher recognizes technological methods as a way to present scientific concepts as well as record and analyze data. [Science S6-D2]*
 - * *The teacher knows how to select materials that match instructional goals as well as how to maintain a safe environment. [Science S11-K1]*
 - * *The teacher knows the safety requirements necessary to conduct laboratory and field activities. [Science S11-K5]*
 - * *The teacher appreciates a laboratory environment that develops critical thinking and problem solving. [Science S12-D1]*
 - * *The teacher recognizes the importance of field activities that develop students' ability to analyze science concepts. [S12-D2]*
- ◆ **Prepare a course outline for a science course taught in grades 7-12 that includes national, state and local goals or standards, a sequence of topics, a grading scheme and list of resources.**
 - * *The teacher evaluates teaching resources and curriculum materials for their accuracy, comprehensiveness, and usefulness for representing particular ideas and concepts. [Core S1-P4]*
 - * *The teacher knows how to enhance learning through the use of a wide variety of materials, human resources, and technology. [Core S4-K3]*
 - * *The teacher appreciates planning as a collaborative activity. [Core S7-D3]*
 - * *The teacher understands that all sciences are related. { Science S1-K2}*
- ◆ **Design a performance task to assess student achievement of a valid science objective, including the criteria for evaluation and a means of communicating overall student performance on the task.**
 - * *The teacher realizes the need to use multiple strategies to assess individual student progress. [Core S8-K2]*
 - * *The teacher is committed to using assessment strategies and communicating results to promote student growth rather than limit student learning opportunities. [Core S8-D2]*
- ◆ **Describe, and support with examples, reasons for inquiry based science instruction in grades 7 - 12, including how such instruction can benefit all students.**
 - * *The teacher values flexibility and reciprocity in the teaching process as necessary for adapting and modifying instruction to student responses, ideas, and needs. { Core S4-D2}*
 - * *The teacher knows how to take into account such elements as instructional materials; individual student interests, needs and aptitudes; and community resources in planning instruction that creates an effective bridge between curriculum goals and student learning. [Core S7-K2]*

The quality of all work is expected to be consistent with normal expectations for upper division pre-service educators. Correct science content, concepts and relationships are required in all work. All written work must be typed, preferably using a word processing program. Assignments may be submitted in electronic form as an e-mail attachment to tsingle@boisestate.edu - **be sure to clearly indicate your name and the program**

(including the platform) used to prepare the assignment and scan for viruses.* Evaluation and grading will be based on your performance of assigned tasks. Each performance will have several traits evaluated according to a specific evaluation standard or rubric. The maximum number of points possible for any trait in any given performance is five (5). A general rubric which outlines the differences in performance levels follows.

General Scoring Rubric

5 Exemplary	Work which transcends class presentations; highly creative, novel, skillful with clear communication and reasoning based on solid evidence.
4 Highly Competent	High levels of understanding and thoroughness are evident with rare lapses, unclear reasoning or insufficient evidence.
3 Competent	Adequate performance with acceptable thoroughness; minor flaws that do not seriously detract from overall quality or unclear communication
2 Developing Skills	Some understanding evident but work is not thorough or has frequent lapses, especially in communication, reasoning and evidence or resources.
1 Beginning Skills	Disorganized attempts with serious errors or misrepresentations based on limited information or reasoning.
0 Not Evident	No attempt or merely re-copying information.

GRADING

Late work will be accepted until **December 8, 2009**.

If you question the application of the rubric on any assignment you have one week from when the assignment is returned to write the reason(s) you think the evaluation is improper and to request re-examination. If any trait was evaluated as less than Competent (<3), you have one week from when the assignment is returned to resubmit the assignment (include the original assignment and the score sheet) for possible re-evaluation. Only the trait(s) receiving less than competent evaluation will be examined. The resulting grade will be the **average** of the two scores for the trait(s), rounded up. **Resubmissions of assignments will not be accepted late. Late work may not be resubmitted.** There will be no "pop" quizzes and no extra credit work. The sum of the possible "points" for all traits for all performances is 200. Grades for this course will be assigned according to the following scale.

A+ 100-97%(200-194), A 96.9-93%(193-186), A- 92.9-90%(185-180),
 B+ 89.9-87%(179-174), B 87-83%(173-166), B- 82.9-80%(165-160)
 C+ 79.9-77%(159-154), C 76.9-73%(153-146), C- 72.9-70%(145-140)
 D+ 69.9-67%(139-1134), D 66.9-63%(133-126), D- 62.9-60%(125-120)
 F ≤ 59%(≤ 119)

TASKS OR PERFORMANCES THAT WILL BE EVALUATED:

Demonstrated Professionalism (20 points)

Your performance as a professional educator in this course will be examined carefully to determine if you have the commitment and skills necessary for successful student teaching and entry into the teaching profession. You are expected to attend every class, to fulfill class assignments on time, and participate fully in class activities as both a leader and a member of a cooperative group. Please inform the instructor by phone or email if you must miss a class or an assignment deadline. **You are also expected to participate in on-line discussion using a web board at <http://discuss.boisestate.edu/WB/default.asp> (there is also a link from the course on-line syllabus).** An acceptable level of participation would be about one entry per week (i.e. a thoughtful response to another student's original post) and initiating four "threads" during the semester. The web board discussion is designed to encourage continued interaction between class meetings and provide a forum for questions and discussion of class activities. The traits evaluated will be your Attendance and Timeliness, Participation, Responsibility and Cooperation and Leadership. The following rubric will be used to evaluate your professional performance.

* It is your responsibility to ensure that any file is complete, current and free of viruses. Please save your file in "rich text format" (.rtf) to ease translation. Use your first initial and last name and a title as the file name.

Demonstrated Professionalism Rubric

Traits	Attendance & Timeliness	Participation	Responsibility	Cooperation & Leadership
5 Exemplary	Attends every class on -time or makes prior arrangements; no late assignments	Frequently volunteers positive, well-informed comments and questions both in class and in web board discussion.	Takes responsibility for own learning and seeks perspectives and knowledge beyond requirements; follows directions.	Solves problems collaboratively - sometimes as a leader; solicits involvement by all in group work .
4 Highly Competent	Misses few classes, infrequently tardy, no more than one late assignment and contacts instructor	Occasionally volunteers comments or questions often based solely on text material; occasionally comments on web board.	Takes some steps to further own learning; shows interest in subject beyond requirements; directions followed.	Participates in cooperative efforts in a variety of roles; respects others' contributions.
3 Competent	Misses no more than 10% of classtime and has few late assignments; seldom contacts instructor	Consistently attentive during class with occasional positive comments; web board comments brief.	Performs course requirements competently without evident interest or disinterest; generally follows directions.	Works cooperatively when directed; rarely leads or initiates solutions
2 Developing Skills	Misses classes with no prior notice, several late assignments or frequently tardy or leaves early	Not always attentive during class, rarely volunteers answers or asks course related questions	Occasionally disinterested; requires convincing or coaxing before activities or assignments	Works only with the same colleagues; adds little to cooperative efforts and never leads
1 Beginning Skills	Misses no more than 15% of class time and is frequently tardy or leaves early	Often inattentive or disruptive; questions and comments unrelated to course requirements or discussion	Consistently disinterested; frequently voices negative comments about subject without suggestions	Is openly antagonistic toward group work or group members; rarely makes positive contributions
0 Not Evident	Misses more than 15% of class time or has numerous late assignments	Consistently inattentive or disruptive; rude or unnecessary comments	Complains about course assignments or subject in non-productive manner	Does not participate in group activities or consistently dominates group situations

Science Course Overview (20 points)

Due by: September 15, 2009

You will write a brief (no more than three pages) overview of a science course taught in grades 7-12. This will include a description and justification for the existence of the course, at least two curriculum goals or standards taken from an identified national, state or local curriculum framework, at least two suggested topics and sample activities linked to both goals. The course justification, goals/standards and content activities should be compatible and interrelated the activities should clearly connect to the justification and both goals. This statement could be written as a possible letter to students or parents or as a brochure encouraging students to enroll in the course. The traits evaluated will be your use of **Language** (clarity, proper grammar and correct spelling), whether the course **Description and Justification** is clear and consistent with national, state and local frameworks or standards and the selected grade, whether the **Goals** or **Standards** are appropriate for the grade and consistent with the Description and Justification, and if the sample **Content Activities** are appropriate for the course, justification, grade and selected goals or standards.

Daily Lesson Planning (35 points)**Due by: October 6, 2009**

You will plan one (1) daily lesson appropriate for a course in your field and submit a written plan following the directions given in this course. The lesson must include scientific inquiry or discovery using a hands-on (sensory rich) investigation. The lesson must also be connected to a specific curriculum standard from the NSES, state or a local curriculum. The following traits will be evaluated: Organization, Objectives, Quality of Inquiry/Discovery, Activity, Standard(s), Lesson Plan Components and Assessment. A complete rubric will be available at least one week before the assignment is due.

Concept/Skill Lessons (40 points)**Due by: November 3, 2009**

You will create an outline for a series, five to ten, of lessons that help student develop understanding of one (or two) concepts and/or related skill(s) appropriate for a secondary science course. The lessons must be connected to at least one specific curriculum goal or standard from an identified (e.g. NSES, state or local) curriculum. The outline must include appropriate objectives for each daily lesson and a complete list of materials necessary for all lessons. The lessons must include at least two hands-on investigations or activities done by students and one appropriate application of technology. Specific suggestions for promoting learning and success for all possible learners (especially females, culturally or linguistically different and those with physical or learning disabilities) must also be included. The following traits will be evaluated: Organization, Objectives, Activities (including safety), Goal(s)/Standard(s), Essential Details (materials), Technology Use, Adaptations/Inclusion and Assessment. A complete rubric will be available at least one week before the assignment is due.

You will complete one (1) of the following assignments. You are encouraged to analyze a lesson you observe or teach during your field experience.

Journal Review (20 points)**Due by: October 27, 2009**

You will research, read and write an analysis of a science education journal article. The article must come from “acceptable” science education journals (such as, *The Journal of Research in Science Education*, *The Journal of Environmental Education*, *Journal of Computers in Mathematics and Science Teaching*, *School Science and Mathematics*, *The Science Teacher*, *Science Scope*, *The Electronic Journal of Science Education* [Available Online: <http://unr.edu/homepage/jcannon/ejse/ejse.html>] or other (check with me first if you are uncertain). The selected article must address one of the following topics: assessment in science, “traditionally underrepresented” populations in science classes, curriculum standards or applications of technology in science instruction. The review (2 to 3 pages) must include a complete citation of the article, a brief summary of the content, a thoughtful analysis of the major points (including some idea of the perspective or standards being used), and a description of specific ways the content of the article could be applied in a classroom setting or reasons why the ideas would be inappropriate for classroom use. The traits evaluated in the review will be Language, Summary, Analysis and Application using the standards described below. A complete rubric and score sheet will be available at least one week before the review is due.

Field Perspectives (20 points)**Due by: November 10, 2009**

You will observe, participate and reflect on some aspect of science instruction with students. This could be a lesson you or your mentor teacher teach (as part of your field experience) or a lesson taught in a special program or other science teaching experience. If you are unable to participate in a field experience, contact your instructor for special arrangements. This task will be evaluated using traits covering Curriculum, Materials, Instruction and Learning. Your report should relate to a single lesson or experience. A complete rubric and score sheet will be available at least one week before the assignment is due.

Course Outline (20 points)**Due by: one week after your group presents your outline**

This will be done in groups of approximately two to four students. You will create a course outline including goals, content sequence, resource list and a grading scheme for one secondary science course: Life Science (7), Earth Science (8/9), Physical Science (8/9), Biology (10), Chemistry or Physics (11/12). Your group will have approximately 10 minutes to present this information on the scheduled date (see course schedule). The outline should include at least six (6) goals or standards taken from an identified curriculum source (if the source is the NSES these should be from more than one area). The grading scheme should include not only the percent ranges for various grades but also the types of activities (i.e. lab reports, tests, homework, etc.) that will be included in the evaluation and the relative weight of each. The sequence of topics should be designed to promote a “logical” flow of learning and take into account typical schedule requirements, such as grading periods, vacations and weather. The resource list should include a text or texts, supplemental materials

(including non-print resources such as videos and URL's) and possible student references and activity guides. Each resource should be clearly and completely cited. The following traits will be evaluated: Goals, Content Sequence, Grading Scheme and Resources. A complete rubric will be available at least one week before the assignment is due.

Evaluation & Grading (25 points)

Due by: December 1, 2009

You will design a science performance task for any secondary science course that evaluates one or more appropriate, clearly listed objectives. Clear directions for the task, possibly including a task sheet, should be stated. You will determine traits to be evaluated and a rubric for at least two of the traits. In addition you will describe how you would communicate performance on the task to the child, a parent or other appropriate person. This could be done with a letter grade or other appropriate method. The following traits will be evaluated: Objectives, Task (directions and setting), Traits, Descriptors, and Communication of Results (Grade). A complete rubric will be available at least one week before the assignment is due.

Final Examination (20 points)

Date & Time: **Tuesday, December 15, 2009, 6:00-8:00 PM**

The examination will be an essay test which stresses analysis and application of learned concepts, **not** regurgitation of memorized "facts." The traits evaluated will be: Language, Synthesis, Coherence, and use of Examples.

Ted J. Singletary, Ph.D.
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426-3270 or tsingle@boisestate.edu
<http://education.boisestate.edu>

Schedule

The following is an approximate listing of the topics to be covered in the course and the related reading assignments in the text. You are expected to have read the assignments by the date listed. All readings are from Bybee, Carlson Powell and Trowbridge (2008) unless otherwise indicated. This list may be subject to change. For example, some local science teachers and administrators will come to class to discuss science education issues.

DATE	TOPICS	(Assignments Due)	PAGES
August			
25	The Nature of Science and Reasons for Science instruction		Syllabus, 1-19 & 39-49
September			
1	National, state and local science curriculum recommendations		50-104 & 141-151
8	Learning Theory and Inclusion in Science instruction		20-38, 105-117 & 273-292
15	Inquiry & Discovery Methods and Labs	Science Course Overview	175-189 & 228-239
22	Planning Lessons & Preparing Objectives		118-131 & 190-211
329	Curriculum Planning, Texts, Resources & Direct Instruction		240-261
October			
6	Assessment, Evaluation and Grading	Daily Lesson Planning	132-140
13	Technology in Science Education — CAI & Tools		262-272
20	Technology in Science Education — Telecommunications & MBL	Journal Review-	
27	Lab Safety & MSDS		234-239
November			
3	Middle Level Science Curriculum	Concept/Skill Plan	152-163
10	HS Science Curriculum (<i>Life Sci., Earth Sci. & Physical Sci. presentations,</i>) Field Perspective		212-226
17	Classroom Management & Controversial Issues (<i>Biology, Chemistry & Physics presentations</i>) ..		164-174 & 293-308
Thanksgiving Break – November 23 –27, 2009			
December			
1	STS & Environmental Education	Evaluation & Grading	
8	Professional Preparation, Summary and Evaluation		309-338
15	Final Exam	Tuesday, December 15, 2009, 6:00-8:00 PM	