School of Education

California State University SAN MARCOS

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Course & Section Nos.	**EDSS 545 B Section 1**
Course Title	**Secondary Science Methods**
Class Roster No.	
Course Day(s)	**Thursdays and one double class on Wednesday**
Time	**5:00-8:00**
Course Location	**UH 439**
Semester / Year	**Spring 2018**
Instructor	**Dr. Joe Keating**
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Office	**In Class**
Office Hours	**By Arrangement**

SCHOOL OF EDUCATION MISSION & VISION STATEMENT
(Adopted by SOE Governance Community, January 2013)

Vision
To serve the educational needs of local, regional, and global communities, the School of Education advances innovative practice and leadership by generating, embracing, and promoting equitable and creative solutions.

Mission
The mission of the School of Education community is to collaboratively transform education. We:

- Create community through partnerships
- Promote and foster social justice and educational equity
- Advance innovative, student-centered practices
- Inspire reflective teaching and learning
- Conduct purposeful research
- Serve the School, College, University, and Community

BASIC TENETS OF OUR CONCEPTUAL FRAMEWORK

- Student centered education
- Research and theory specific to the program field inform practice
- Connections and links between coursework and application
- Strong engagement between faculty and candidates
- Co-teaching clinical practice
- Culturally responsive pedagogy and socially just outcomes

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COURSE DESCRIPTION

This course will be held both fall and spring semesters for a total of 4 credits (approximately 30 contact hours per semester, 2 credits per semester). It fulfills the requirement for a methods course for all Single Subject (Secondary) Science credential students. Upon completion of this course, the preservice teacher will be able to formulate a basis to teach standards based science course in the secondary school in a manner that is exciting, creative and rigorous. To accomplish this, the candidate will formulate a personal framework of science education based on both a historical/philosophical perspective as well as from knowledge of the state and national frameworks and other reform documents. Using this knowledge as a framework, he (she) will learn to apply multiple strategies and resources for the development of unit plans, instructional delivery and assessments that utilize a student-centered, inquiry (problem-solving) and community based approach to the teaching of science for all students. This should be in evidence during Clinical Practice 1 and 2 as part of the required Teacher Performance Assessments (TPA). **Classes will consist of formal class meetings, field trips, video conferences and independent study totaling approximately 20 seminars @ 10 seminars per semester @ 3.0 hrs.each**

Course Prerequisites

Admission to the Single Subject Program or pursuit of a single subject Science add-on credential (by permission) is required to enroll in this course as well as EDUC 350, EDUC 364, & EDUC 422 or equivalent.

Course Objectives

1) The teacher candidate will be able to apply **the major concepts of frameworks and standards in Science Education** to their curriculum based on the California Frameworks in Science, the Next Generation Science Standards (NGSS) as well as the general recommendations for science education indicated by international studies such as Tests of International Science and Math Study (TIMSS);

2) The teacher candidate will be able to understand what is learned from the **general history, ethics and philosophy of science education** in the United States and how it might apply to current educational practice;
3) The teacher candidate will understand and be able to **integrate a variety of diverse resources** appropriate for science education including texts, lab manuals, equipment, technologies and both informal and formal community related resources;
4) The teacher candidate will be able to apply to the curriculum and their students the **major concepts of safe and effective science teaching and learning** to laboratory and general classroom practices;
5) The teacher candidate will be able to effectively **implement the major teacher strategies considered best practices in Science education** such as interactive expository teaching; inquiry-based learning; open-ended laboratory experiences; teaching from argumentation and the integration of community/ field resources (internships, service-learning and school to career);
6) The teacher candidate will be able to appropriately integrate a range of strategies for the integration of a variety of **diverse assessments** including both formative/summative that can be authentic or traditional;
7) The teacher candidate will be able to apply the protocols and learning strategies required in **science inquiry-based enrichment activities** such as Science Olympiad, Odyssey of the Mind, Invention Convention, FIRST and Science Fair that extend beyond the standard curriculum;
8) The teacher candidate will be able to demonstrate their ability to **integrate the sciences as well as other disciplines** into the standard science curriculum (interdisciplinary curriculum) as a major tenet of NGSS;
9) The teacher candidate will be able to **include all students in the curriculum** by applying the major curricular and pedagogical strategies for teaching multicultural, multilingual students (SDAIE/ELL);
10) The teacher candidate will be able to identify issues involved in the teaching and learning of science and apply **teacher-led research designs (action research)** for the ongoing purpose of improving practice.

REQUIRED TEXTS, MATERIALS AND/OR ACCOUNTS

*Science Instruction in the Middle and High School (*Chiappetta and Koballa) (2014 8th Edition) + Video Analysis of Classroom Teaching (see CSUSM bookstore).

Use of Discrepant Events for K-12 Science Teachers (Aztec Press /University Bookstore), (Keating Customized text)

Flinn Scientific http://www.flinnsci.com/teacher-resources/safety/general-laboratory-safety.aspx

California Science Safety Manual for K-12 Schools (2012)
http://www.cde.ca.gov/pd/ca/sc/documents/scisafebk2012.pdf

Next Generation Science Standards (NGSS): Overview and Conceptual Shifts and Complete Standards
http://www.nextgenscience.org/next-generation-science-standards
http://www.nextgenscience.org/sites/ngss/files/NGSS%20DCI%20Combined%2011.6.13.pdf

CA/NGSS Clarifications/Examples
http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp

NGSS Sample Science Unit= http://www.nextgenscience.org/sites/ngss/files/HS-LS_Bee_Colony_version2.pdf

Online resource: EDMODO (details to be discussed in class)

COURSE LEARNING OUTCOMES

These objectives will be measured (by utilizing rubrics) through the successful application of the concepts during the completion of specific assignments (see descriptions). Prior to completing the assignments, students will be presented with opportunities to discuss effective models and examples, using texts and other readings and through discussions both in-class and EDMODO (blog). The expectation is that they will successfully and seamlessly be able to integrate these applications in clinical practice 1 and 2 (as measured by supervisor's observation as indicated in the teacher performance applications (TPA). These are the Course Learning Outcomes (CLO's)

Authorization to Teach English Learners

This credential program has been specifically designed to prepare teachers for the diversity of languages often encountered in California public school classrooms. The authorization to teach English learners is met through the infusion of content and experiences within the credential program, as well as additional coursework. Candidates

successfully completing this program receive a credential with authorization to teach English learners. *(Approved by CCTC in SB 2042 Program Standards, August 02)*

Teacher Performance Expectation (TPE) Competencies

The course objectives, assignments, and assessments have been aligned with the CTC standards for the Single Subject Credential. This course is designed to help teachers seeking a California teaching credential to develop the skills, knowledge, and attitudes necessary to assist schools and district in implementing effective programs for all students. The successful candidate will be able to merge theory and practice in order to realize a comprehensive and extensive educational program for all students. You will be required to formally address the following TPEs in this course:

Teacher Performance Assessment

Beginning July 1, 2008 all California credential candidates must successfully complete a state-approved Teacher Performance Assessment (TPA), as part of the credential program of preparation. During the 2015-16 academic year the CSUSM credential programs will use either the edTPA (Educative Teacher Performance Assessment).

edTPA

Beginning in fall 2015, for newly entering initial candidates, the CSUSM assessment system is the edTPA. To assist with your successful completion of the edTPA, a capstone class is part of your curriculum. In this class edTPA related questions and logistical concerns are addressed. Additional support materials are available on the edTPA website: http://www.edtpa.com/PageView.aspx?f=GEN_Candidates.html

Additionally, to support your success in your credential program and with TPA, SOE classes use common pedagogical language, lesson plans (lesson designs), and unit plans (unit designs).

Expected Dispositions for the Education Profession

Education is a profession that has, at its core, certain dispositional attributes that must be acquired and developed. Teaching and working with learners of all ages requires not only specific content knowledge and pedagogical skills, but positive attitudes about multiple dimensions of the profession. The School of Education has identified six dispositions that must be evident in teacher candidates: social justice and equity, collaboration, critical thinking, professional ethics, reflective teaching and learning, and life-long learning. These dispositions have observable actions that will be assessed throughout the preparation program. For each dispositional element, there are three levels of performance - *unacceptable*, *initial target*, and *advanced target*. The description and rubric for the three levels of performance offer measurable behaviors and examples.

The assessment is designed to provide candidates with ongoing feedback for their growth in professional dispositions and includes a self-assessment by the candidate. The dispositions and rubric are presented, explained and assessed in one or more designated courses in each program as well as in clinical practice. Based upon assessment feedback candidates will compose a reflection that becomes part of the candidate's Teaching Performance Expectation portfolio. Candidates are expected to meet the level of *initial target* during the program.

SCHEDULE/COURSE OUTLINE

Date	Topic	Assignment (if any)	Due Date
Session 1 2/1/18	Expository/Lecture Teaching in Science	Mini-Lecture Presentation	TBA
Session 2 5/2/18 AM	Using Field Trips in Science Teaching	Safari Park Lesson Plans and Beckman Center Laboratory	5/2/18
Session 3 5/2/18 PM	" "	" "	" "
Session 4 2/15/18	Technology Resources in Science	Assignment #4/#5 Effective Web Pages and Tools for applying Technology	February 15
Session 5 3/8/18	Effective SDAIE Strategies in Science	Assignment # 8 SDAIE Lab Action Research Study	April 26
Session 6 3/29/18	Extracurricular Strategies in Science	OM and Invention Convention Activities	**April 26**
Session 7 TBA	Independent Study on Science Teaching	Final Report of independent study	May 4

Date	Topic	Assignment (if any)	Due Date
Session 8 4/12/18	Using Action Research (Case Study #2)	Preliminary Report #2 Baseline Data and Action Plans	April 6
Session 9 4/26/18	Effective SDAIE Strategies in Science	Final Action Report Report	April 26
Session 10 5/4/17	Data analysis and Report on Case Study 2	Presentation of Case Study Final Report/ Book Report/Independent Study	May 4

COURSE REQUIREMENTS AND GRADED COURSE COMPONENTS

Course Assignments

The Assignments and point value for both semesters are listed in numerical order and described in more detail in the following section "Description of all assignments".

The final grade for EDSS 545 A/B with be the % of total points earned that semester converted to a letter grade (93-100=A; 90-92=A-; 83-89=B; 80-82=B- ; 76-79= C+; <=75 = C or lower (not passing). **Assignments are due on time and will not be accepted late unless there are extenuating circumstances**. Assignments that are used in the Fall only * Spring only ** and both semesters *** are indicated with the appropriate number of asterisk(s).

***1) Attendance/participation **both semesters** (5 pt. per class) (50 pts.)
***2) Sci. MethodsText Readings/Prompts (6pts)/Responses (three) (3 pts)/ (**both semesters)** (9 pt.)
* 3) A/B/C Jigsaw of Next Generation Science Standards (NGSS) (25pts)
** 4) Evaluation of best practices for education technology tools (I-Pads/I-Phones) and software (10 pts)
** 5) Evaluation of Science Internet sites (10 pts)
* 6) A/ B Inquiry---Discrepant event reflection (5pts.)/ Presentation(s) (25pts) (30 pts)
** 7) Applying Action Research by comparing SDAIE to Traditional Labs (35pts)
* 8) Development of an outline for a Personal Plan for Science Safety (10 pts)
* 9) Observation of science lesson(s) (15 pts.)
** 10) Enrichment and extracurriculum science programs (40 pts)
** 11) Book Report on high interest science book (10 pts.)
***12) Open ended/independent science study **both semesters** (10 pts)
** 13) Strategies for implementing field trips at the high school level (Safari Park/CRB) = (20 pts)
** 14) Researching and presenting a mini-lecture on a current topic in science (25pts)
***15) Case Studies (**both semesters):** Issues in student teaching Clinical Practice =(5+5+5 +20 pts)=35pts.)
* 16) Implementing Open-ended (Inductive) vs. Closed Ended (Deductive) Labs/ Experiments (10 pts.)

Optional/Extra credit: (maximum 10 pts per semester)
1) Directorship (5 pts.)
2) SDSEA or CSTA or NSTA or other Conference in addition to open assignments (5 pts. one day)
3) Teaching the DE during CP 1 or Mini-Lecture during CP 2 (5 pts.)
4) Other (determined by arrangement with instructor)

Point's summary:
Spring Semester:
Assignments #1 (50 pts); #2 (45 pts.) #4 (10 pts); # 5 (10 pts.); #7 (35 pts.) #10 (40 pts.); #11 (10 pts.); #12 (10 pts.); #13 (20 pts.); #14 (25 pts.); #15 (35 pts.) = 290 pts

Grading Standards

School of Education/Course Attendance Policy

Due to the dynamic and interactive nature of courses in the School of Education, all candidates (course participants) are expected to attend all classes and participate actively. At a minimum, candidates (course participants) must attend more than 80% of class time, or s/he may not receive a passing grade for the course at the discretion of the instructor. Individual instructors may adopt more stringent attendance requirements. Should the candidate (course participants) have extenuating circumstances, s/he should contact the instructor as soon as possible. *(Adopted by the COE Governance Community, December, 1997).*

Note: Both attendance and punctuality are essential to completing all work satisfactorily. Point values are assigned for each class (5 pts per class or 10 pts for field trips). In addition, only 50% of the potential value for an assignment can be credited as makeup for an assignment that is due and reviewed in a class that was not attended by the student. Two absences in one semester can result in a minimum of one grade

lower; three absences can result in a non-passing grade (unless there are extenuating circumstances). Late arrivals will be penalized at the discretion of the instructor.

GENERAL CONSIDERATIONS

CSUSM Academic Honesty Policy

Students will be expected to adhere to standards of academic honesty and integrity, as outlined in the Student Academic Honesty Policy. All assignments must be original work, clear and error-free. All ideas/material that are borrowed from other sources must have appropriate references to the original sources. Any quoted material should give credit to the source and be punctuated accordingly.

Academic Honesty and Integrity: Students are responsible for honest completion and representation of their work. Your course catalog details the ethical standards and penalties for infractions. There will be zero tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to the instructor's attention. The instructor reserves the right to discipline any student for academic dishonesty, in accordance with the general rules and regulations of the university. Disciplinary action may include the lowering of grades and/or the assignment of a failing grade for an exam, assignment, or the class as a whole.

Incidents of Academic Dishonesty will be reported to the Dean of Students. Sanctions at the University level may include suspension or expulsion from the University.

Refer to the full Academic Honesty Policy at:
http://www.csusm.edu/policies/active/documents/Academic_Honesty_Policy.html

Plagiarism

As an educator, it is expected that each candidate (course participant) will do his/her own work, and contribute equally to group projects and processes. Plagiarism or cheating is unacceptable under any circumstances. If you are in doubt about whether your work is paraphrased or plagiarized see the Plagiarism Prevention for Students website http://library.csusm.edu/plagiarism/index.html. If there are questions about academic honesty, please consult the University catalog.

Students with Disabilities Requiring Reasonable Accommodations

Students with disabilities who require reasonable accommodations must seek approval for services by providing appropriate and recent documentation to the Office of Disability Support Services (DSS). This office is in Craven Hall 4300, contact by phone at (760) 750-4905, or TTY (760) 750-4909. Students authorized by DSS to receive reasonable accommodations should meet with their instructor during office hours. Alternatively, in order to ensure confidentiality, in a more private setting.

Credit Hour Policy Statement

Per the University Credit Hour Policy:
Courses with face-to-face instruction:
Since this course is considered a "lecture mode" of instruction per university policy, expectations are that students will spend a total of approximately 30 hours of class time per semester (2 credit class X 15 hours per credit= 30hrs). In addition, students are expected to spend about 4 hours per class meeting (2 hours per credit hour X 2 credits) in preparation, assignments and readings.

All University Writing Requirement

The writing requirements for this class will be met as described in the assignments. Every course at the university, including this one must have a writing requirement of at least 2500 words

Electronic Communication Protocol

Electronic correspondence is a part of your professional interactions. If you need to contact the instructor, e-mail is often the easiest way to do so. It is my intention to respond to all received e-mails in a timely manner. Please be reminded that e-mail and on-line discussions are a very specific form of communication, with their own nuances and etiquette. For instance, electronic messages sent in all upper case (or lower case) letters, major typos, or slang,

often communicate more than the sender originally intended. With that said, please be mindful of all e-mail and on-line discussion messages you send to your colleagues, to faculty members in the School of Education, or to persons within the greater educational community. All electronic messages should be crafted with professionalism and care.
Things to consider:

- Would I say in person what this electronic message specifically says?
- How could this message be misconstrued?
- Does this message represent my highest self?
- Am I sending this electronic message to avoid a face-to-face conversation?

In addition, if there is ever a concern with an electronic message sent to you, please talk with the author in person in order to correct any confusion.

Grading Standards /Overview of Assignments

Description of all Assignments (by number): both semesters included

Assignment 1 Attendance and Participation (each class counts 5 points) In the event of an absence any assignments due that night could receive only 50 % of the potential credit (if made up) since you were not there to interact and discuss the assignment with your colleagues.

Assignment 2 Science readings in text (9 points each chapter) Each chapter is assigned a value of nine points that includes your response to a prompt = 6 pts. (see specific text chapter) This is followed by a discussion with your colleagues in class. **You are expected to respond to at least two students and myself on EDMODO for each assigned reading (3 pts).**

Assignment 3 – Understanding and applying the Next Generation Science Standards (NGSS) (25 pts)

Spirit of the assignment:
This assignment overviews what (content) should be taught and what (process/strategies) research suggests is most effective in teaching science to all students. This overview will lead to you and your team to apply your understanding of these standards and strategies by integrating them in an inquiry-based lesson. These same skills will be elaborated on throughout the course and during CP 1 and 2 and will be applied numerous times in other assignments. It is also essential to your training as a science teacher to understand the general principles of this new paradigm as you seek potential employment.
More specifically your colleagues as members of different science subject matter teams will assist in overviewing the entire NGSS (by using the jigsaw method). This beginning learning process consists of three components 3a, 3b and 3c (see specifics below).
In 3a, you will individually read and respond to NGSS documents as well as view NGSS video's independently from the various areas of the NGSS (see two links under required texts (Flip Classroom model).
In 3b, you will individually use the information and examples from these documents to create an outline of a lesson plan (see specifics below).
3C will be completed in class with your subject matter team and consists of discussing the important ideas from the NGSS readings and sharing your lesson plan with your subject matter team (Jigsaw 1). Each subject matter team will choose one representative lesson to elaborate and enhance and use this to demonstrate their understanding of a specific standard for their content area (Physics, Chemistry, Earth or Life Science) for the entire class (Jigsaw 2). During the subject matter team presentation to the whole class (10 minutes) the following should be accomplished: 1) Present an overview of your inquiry based mini- lesson; 2) Present a short overview of all the major standards expected to be addressed in your subject area; 3) Give a rationale for which standards might be de-emphasized or eliminated if time is a factor; 4) Address questions from other subject level teams. team in class. In the 10-minute presentation you should be able to accomplish the following: **It's essential to your beginning understanding of NGSS that you do the reading, responses and individual lesson plan BEFORE you meet with your subject matter team in class.**

NGSS Standards/Framework specific tasks

3A Individual Work (prior to class) (10 points) Use this link to assist as an overview
http://www.nextgenscience.org/next-generation-science-standards

Read the following Framework sections and take notes and suggest questions for discussion in class from the NGGS that are representative of a beginning understanding: 1) NGSS Front Matter (Executive Summary); 2)

Structure of the NGSS (How to Read it); 3) Conceptual Shifts (How is it different); 4) View these two videos: "Why NGSS" and "NGSS Overview"; 5) **Briefly scan the introductions for the following sections:** Sections D-J.

Read and summarize all the NGSS standards for your subject matter area (Physical/Chemical, Life or Earth and Space Sciences) Use the CA/NGSS link= http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp since this provides some examples and clarifications that might be useful. With a focus on your major content subject areas (Grades 9-12) select **at least one standard** to create a lesson outline as described in 3B below.

3B Individual work (prior to class) Science subject standards response (only your subject area) (10 points)

- Using the standard (s) you chose for your subject area in 3a 1) Write the standard(s) and the context of the lesson; 2) come up with a brief description of an **inquiry based lesson activity** that students in that subject area can do to assist in understanding the standard and; 3) explain in what ways you would assess their knowledge and 4) how could this lesson incorporate the other ideas discussed from the NGSS concepts (cross discipline ideas; engineering/modeling concepts; applying technology and including math and language arts) as well as any other ideas suggested in the NGSS. Here is a link that describes a unit plan with a number of lessons linked to the ideas of the NGSS standards related to Bee Colony losses in the environment. It is very elaborate and of course beyond the scope of what you are doing here but could serve as a model of what might be done= http://www.nextgenscience.org/sites/ngss/files/HS-LS_Bee_Colony_version2.pdf

3C.**Team preparation and presentation** (5 points)

- Get together with your team by subject areas (chemistry/ physics, biology, earth science). Look at the activities that everyone wrote up for Assignment 3b. Choose one that your team feels is the best representation of the application of the standards/frameworks or integrate two that may work together. Elaborate and enrich the original based on input from all members.
- As a team, write up a final lesson plan for the activity stating the standard(s) (with activities, assessment,). This lesson plan should integrate the ideas from the NGSS Standards as well as discussed in 3b above. Compose a **visual representation** of it. As a team, think about the entire set of standards for the subject area. ? Make a list to present to the class, and be prepared to give your reasons for your choices.
- Summary: In 8 minutes or less, 1) present a visual representation of your inquiry based lesson plan to demonstrate how a standard(s) and the major themes of the NGSS/ frameworks might be integrated into this lesson; 2) present an overview of the major standards expected to be addressed in your subject area; 3) which ones would your team de-emphasized or eliminate if time is a factor; 4) address any questions from classmates.

Assignments 4 and 5 (Evaluation and Use of Technology Resources) Spring Semester Only
Assignment 4 Internet Sites (10 pts);
Assignment 5 Technology tool/software as utilized by the I-Pad (10 pts)

Spirit of the Assignment: Individually explore Internet resources (web pages, simulation games etc. and technology tools and apps (such as the I-Pad).

For assignment #4 explore in detail at least one Internet site that is a valuable for teachers or students for information, simulation etc. List the URL and access it on Smart classroom projector and navigate the site and explain how you would use it in your classroom

For assignment #5 explain or demonstrate a **tool or strategy (app)** in front of class and how you would apply it to the Science classroom.

Assignment 6: Inquiry based Discrepant Event Presentation (30 pts)

Spirit of the Assignment: To develop and teach a particular kind of a science inquiry lesson that teaches both Science thought processes and science content (applies the NGSS standards). You will practice your discrepant event with a middle or high school age student(s) and reflect on the student's responses and their understanding/misunderstanding and make appropriate modifications. You will then present your modified discrepant event to the class and give a copy of the lesson plan to each class member (see model lesson from "Bouncing Balls" DE Presentation or Discrepant Event Textbook). **Teaching and reflecting on the DE in CP 1 will be rewarded with extra credit (Lesson Study Model)**

6a. **Discrepant Event Lesson Plan and Presentation** 25 points

- Select a discrepant event lesson that connects to the subject matter of your CP1 experience. As a model for your lesson plan you can get one from Discrepant Events, by Keating, or go to another available resource. Be sure to include an appropriate NGSS (as well as some of the elements suggested by these) or CA standard (s).

- Get together the materials needed for the discrepant event.
- Practice doing the event on your own and then with some student aged individuals (see 6 B).
- Make sure you understand the science behind the event.
- Do your discrepant event with at least one middle or high school age student prior to doing it in class and take careful notes on the student's responses. (This ties in with Assignment 6b reflections.)
- Present your DE to the class as if they were your students. At some point, make sure you explain the context of the lesson and what would you do before and or after it (You may discuss your findings from the pre-event DE with your classmates as part of this presentation.
- You are limited to 15 minutes of actual presentation time.
- After presenting your event, give a copy of the DE lesson plan to each member of the class and your reflective individual journal to the instructor (see 6B)
- Using what you learned by doing it at least twice (Lesson Study Model) apply this DE to one of your courses in CP 2 (optional but extra credit (5 pts.) for doing it and reporting on how it went)

6b. **Discrepant event journal (Reflection on Pre-Event)** 5 points

- Prior to presenting your DE in class, practice it as a pre-event discrepant event with a student, look at your notes and think about how it went. (You may realize that your event needs to be modified before you do it with the class.)
- Hand in a written description of what happened, with special attention to what the student said and did. Analyze the student's response: what portions of the event did the student understand (not understand) what was happening? Did they understand the underlying science concept? What modifications to what you say or do might be necessary for better understanding? **Share these ideas after you do the DE in class.**

Assignment 7: Applying Action Research to a Science Lab (SDAIE) modification (35 pts) Spring Semester (See Addendum B for Final Report Template) Spring Semester Only

Spirit of the Assignment: Use an existing science lab or activity that you will use in CP 2 and revise it to be more appropriate for second language learners (use SDAIE/ELL techniques as discussed in this course (Ch. 12) as well as others you have had). You will use the action research model to evaluate its effectiveness by comparing outcomes of experimental lab (SDAIE) with a control (original lab or activity) using classes you teach in CP 2.
Specifics of the assignment: The assignment consists of four parts.

- **Discuss readings and other resources related/connected to ELD** Standards and related strategies as a basis for modification of existing laboratory activities.
- Display a copy of the original **science lab or activity and revised SDAIE lab** (5pts) explaining the adaptations you have made (5pts);
- **Design an action research proposa**l using the action research design (see syllabus) and present this to the class for discussion (5pts).
- After you have completed the research present the findings (**Final report**= 15 pts) by comparing outcomes from the two lab classes one of which used the original lab (control) and another which used the modified SDAIE lab (experimental).
- Complete the **Research Data Grid** for your study to enable a meta-analysis of data for the whole class (5 pts.)

Assignment 8 Development of a personal Plan for Science Safety (10 pts)

Spirit of the Assignment: Use your readings from the safety manuals (Flinn and CA) Safety documents, Chapter in text etc.) and the interview with a science teacher to propose an outline of a **Plan for Science Safety** that you will (can) use within your science discipline. More specifically this might include: information/resources from your MT interview assignment 9B: safety contracts, demonstrations, laboratory protocols, lesson plans they use to teach safety, as well as any general experiences in dealing with science safety. This will be sent to EDMODO and shared with others during a class discussion.

Assignment 9 Observation of science lessons and teaching strategies (15 pts)

Spirit of the assignment: To objectively and formally observe and critically analyze a science lesson. During your observation/participation time you will find a science teacher who may or may not be your own master teacher. For #9 you will interview the teacher before and after the lesson. If possible, it's good to also talk with some of the students after the lesson (see some general guidelines and questions you may use for 9 below).

Some suggestions/ guidelines for completing 9 A (10 pts):

GENERAL INFORMATION: grade level, subject area, description of the activity/standards as well as responses to some of the suggested prompts below should be sent to EDMODO and will be discussed in class.

BEFORE (Interview)

- How did the teacher come to do this lesson? (Is it linked to the NGSS or CA Standards?)
- How did he/she pick the topic?
- Where did the materials come from?
- In general, how does the teacher think the student's have/ will respond to the lesson?
- Identify some students in the class who will like this lesson and do well on it.
- Identify some students who might have difficulty, either cognitively or behaviorally and describe the problems they are likely to have and how the teacher might adapt in consideration of this.

DURING (Observation)

- Is there a written or unwritten plan for this lesson?
- Does it include some elements of inquiry (in the discourse, in the activity, in the assessments)? Does it contain /technology/engineering? Does he/she link the topic to other lessons/subjects?
- What are the objectives and or key questions (if this/these are unstated, you will have to figure them out)
- How does the teacher know that the objectives were met at the end of the lesson (formative or summative assessments)?
- How does the teacher know how the lesson is going as the lesson progresses/ whether the students are getting it? (Formative i.e. checking for understanding)
- Does the teacher make any adaptations to address the needs of the children who have difficulty (ELL/Special Needs)?
- Can you clearly follow the procedures the teacher is using as well as understand the science concept and do they relate directly to the objectives?
- What other non-instructional strategies supported or distracted from the teaching of this lesson?
- Were language arts skills (oral language, reading, writing) and or mathematical processes included in the lesson?

AFTER (your analysis, interview with teacher, and if possible, some students)

- How successful (unsuccessful) was the lesson? Explain?
- Did the teacher correctly predict the performance of specific students?
- Did the adaptations (if there were any) work?
- How about the class as a whole – were the students engaged?
- Did they learn the skills and or content? How did you know?
- Were there any logistical problems?
- If you taught this lesson, how would you change it? (Include as many things as you can think of. Even if the lesson was wonderful, come up with at least one modification of your own).

Assignment 10: Enrichment and Extracurriculum Science Programs (Spring Semester only (40 pts)

Spirit of the Assignment: Students will research, overview, present and discuss some of the major extracurricular/enrichment activities used in Science such as Science Research Projects (Science Fair/ Pure Science), Odyssey of the Mind (Problem Solving), Science Olympiad, FIRST (Robotics) and Invention Convention (Applied Science). Elements of some of these models will be applied by simulating the actual process used by teachers in a classroom. The process includes the following: 1) Overview of each of the five programs above by teams in class (PPT with visuals)= 10 pts. 2) Practice short term OM problem= "Superlinks"= 10pts.; 3) Students will be assigned teams and specific problems for Odyssey of the Mind (Long Term Problem, Spontaneous Problem and Style) and (or) the Invention Convention. 4) Using the processes recommended and timelines (and examples reviewed) teams will follow the processes and enter their formative tasks on Google Docs (instructor will provide ongoing feedback and evaluation on Google Docs for each team; 5) Teams will present their final solution to each project and be evaluated by the rubric (see syllabus) and compared to the other teams =20 pts.

Assignment 11 Book Report on high interest science book (10 pts.) Spring Semester only

Spirit of the assignment: read a new book in fiction or non-fiction that you would like to read for general interest, deep background or for inclusion in your own class. By reading yourself you increase the likelihood that you will include science reading as part of the curriculum for your own students. Share this electronically with your classmates.

For this assignment read, summarize, rate (1-5 with justification) and make recommendations on how you might incorporate into your teaching either directly indirectly. Share this formal review electronically with instructor and classmates as well as during the general class discussion.

Assignment 12 Independent Study: Attendance at a formal or informal science event, presentation or site (10 pts each semester 20 pts in all) Both semesters

Spirit of the assignment: By attending formal or informal outside events, a science teacher is more likely to create assignments that encourage their own students to seek out such events and include them as part of their curriculum. After having completed assignment # 12 write up a brief report summarizing it and how you might use it in your teaching 1) do a 1-2 minute presentation in class and 2) send a copy to EDMODO.

Assignment 13 Attendance at a field trip to the Safari (Safari Park)/ Center for Reproductive Biology (Spring 20 pts)

Spirit of the assignment: by attending this field trip students will gain an understanding of: 1) general procedures for planning and implementing a field trip in science for all students including ELL; 2) how to access and use resources of the site in a variety of ways prior to the field trip; 3) Pre, during and post lesson plans that apply the science standards by applying two examples during the field trip: a) development of outline of an original teacher implemented lesson plan. (Animal Observation Study) and b) implementing a lesson developed by the Beckman Center (formerly the CRB).

Assignment 14 Research **a current issue or topic in science and present a mini-lecture that you can apply in your own class (es) (25 pts). Spring Semester only**

Spirit of the assignment:

A) Research a current issue or topic that could be used in a class you are scheduled to teach in CP2. The instructor will model an inquiry-based mini-lecture or a teaching science from argumentation that applies NGSS standards. A rubric will be developed through a class discussion based on information on effective lectures from Ch. 11 and used to evaluate each mini-lecture. During this 15- minute mini-lecture you model/integrate some of the effective pedagogical strategies discussed in class. The class audience and instructor will evaluate/provide feedback using the rubric for applying a Science Mini-Lecture. (20 pts)

B) Jigsaw exemplary TED talks that model specific aspects of effective lectures (list to TBA). Briefly outline a written description of each describing what were effective aspects of the talk for other class members (5pts)

C) **Optional extra credit (5 pts.).** Based on the class discussion after you have presented your mini-lecture, use this revised version as part of one of your lessons in CP 2. This can assist you in the development of a videotape lesson as part of TPA 4.

Assignment #15 Issues in Science Teaching (Case Study/Action Research Approach-See Addendum C): both semesters (35 pts each semester)

Spirit of the assignment: Learn to apply a teacher-directed research model during CP 1 and 2 (Case Study/Action Research) in a collaborative setting that 1) addresses teaching issues/ problems (baseline data); 2) create potential solutions (action plans) to the address the issue (related to content, curriculum, teaching strategy and (or) classroom management); 3) collect multiple sources of data to evaluate/analyze results; 4) report findings and suggestions/recommendations. Preliminary reports will track progress of study in collaboration with the class members #1 (Statement of issue(s) (5pts), #2 (Baseline data and action plans)(5pts.) and #3 (Preliminary Data) (5pts.). #4 Final written report **(should include a short abstract** and oral Case Study report will be presented at the end of each semester. (20 pts.) =35 pts. total

Assignment #16 Comparing The Value of Open ended Inquiry/ Inductive Lab experiences to Closed Ended (Deductive) (10 pts.)

Spirit of the Assignment: Teams will be presented with a problem called the "Paper Towel Experiment" and using the Scientific Method (or 5 E Inquiry Model) design an experiment using "tools" on hand. Teams share the design, data and findings of the experiment and (value /challenges) of having students use this model. Ideas for implementing and integrating inductive/inquiry learning in the Science classroom are shared.

EDSS 545 B Course Schedule/Calendar and Outline:

Assignments due prior to Class #1 February 1

For Class #1:

1) After Reading Ch. 11 (Lecture) respond to this prompt and send online to EDMODO: **What are the pros and cons of using lectures (expository teaching)? Which of the ideas in this chapter will you incorporate in your 15-minute mini-lecture? What questions do you have about lectures and the other strategies suggested in this chapter? Send online to EDMODO prior to first class.**

2) Review syllabus for second semester prior to class with special attention to the following: 1) copy spring semester grade sheet; 2) assignments required this semester; 3) description of each assignment. BRING ANY QUESTIONS TO CLASS

#1 February 1 (Thursday) Theme: The lecture/expository teaching as a strategy in Science

- Review syllabus for second semester prior to class with special attention to the following: 1) copy spring semester grade sheet; 2) assignments required; 3) description of each assignment. BRING ANY QUESTIONS TO CLASS
- Overview of a graphic organizer for semester 2
- Discussion of prompt from Ch11 (Effective Use of Lectures) (set schedule of mini-lectures). Should be entered on EDMODO prior to class. Some students might select "Teaching Science using Argumentation"
- *Discussion of assignment regarding ratings of technology tools (I-Pad) #5 and Internet web resources #4 (see description in syllabus).
- Keating mini-lecture #1 Model lecture that integrates some of the ideas from Ch. 11 "Factors that affect the success of Navajo Students in High School Science" (Schedule for Mini-Lectures)
- Interview Questions Forum

Next time:

1) Per schedule (2-student presentation maximum) prepare a mini lecture as part of a small unit on some current topic/issue in Science as one of your classes this semester Assignment #14

2) Presentation/Handout of ratings of technology tools/ (I-Pad) #5 and Internet resources #4 (Demo one of the top ideas for each)

3) Read and address prompt for Ch. 13: **"Laboratory and Fieldwork": What are some suggestions for effective use of both of these strategies especially making them more inductive/inquiry based? List a variety of alternative and traditional ways that laboratories and field experiences can be assessed? In your experience so far what observations have you noticed that make both of these strategies less effective (and what would you suggest to overcoming these challenges?). Questions? Send online to EDMODO prior to next class.**

4) Read Ch. 15 Computers and Educational Technology. **Based on the content of each of this chapter: Discuss the range of technologies you have used (or seen) that you believe are effective in the science classroom (Elaborate and Be specific). What are some technologies that you have not used but would like to have? What are some issues in using technology in teaching science? Questions? Send online to EDMODO prior to next class. Note: Due February 15 to EDMODO**

#2/#3 May 2 Wednesday 900-300 Field Trip to a Formal Science Resource Community site (Safari Park and Beckman Center): Theme: Use of Community Resources in the Curriculum (Assignment #13)

- Educational Resources at the Safari Park (based on handouts/Webpages)
- Suggestions/Recommendations on how to effectively conduct a field trip in Science
- In subject matter teams: Design a pre/ during/post lesson plan for an Animal Observation Study at the Safari Park t (final team written design made available to all via Edmodo)
- Complete Lab at the Beckman Center (Reflect/Discussion with group)

#4 February 15th (Thursday) Theme: Technology resources in Science

- Guest Speaker
- Presentation of mini lesson on current topic in science (15 minute max) (aligned with Ch. 11 Lecture Strategy) Assignment #14 (1-2 presentations)
- Discussion of Best Practices in Science Teaching from both technology tools/software and Internet Resources for assignments:

#4 explore in detail at least one Internet site that is a valuable for teachers or students for information, simulation etc. List the URL and access it on Smart classroom projector and navigate the site explaining how you would use it as a resource.

#5 explain or demonstrate one use of the I-Pad/I-Phone or other science technology tool, that you have used or know how to use that would be valuable for a science teacher.

- Discussion of prompt responses from Ch. 13 and Ch. 15 on technology (online).
- Keating mini-lecture #2: " Brain Research and Education Pt. 1"
- Interview Questions Forum

Review Assignments for Next class:

1) Reading prompt in response to Ch. 9 (Teaching for Diversity): **As a result of this reading as well as others from EDSS 555: What are some specific SDAIE strategies (teacher, student and curricular) you would (or have) used to adapt learning for second language learners in your science classroom (elaborate and be specific)? Specifically which ones would you utilize for lab exercises? (Send response to EDMODO prior to next class)**

2) Issues in Science Student teaching formulate a **question or problem** that you will address in CP 2 (development of Case Study 2 Issue(s) (#15) Send to EDMODO prior to class.

#5 March 8 Thursday Themes: SDAIE instruction in Science

- Discussion of reading response to prompt from Ch. 9 Diversity in Science Instruction (online) as lead-in to Overview of SDAIE action research project assignment (#7)(see addendum B for format and process)
- Keating mini-lecture #3: " Successful SDAIE/ELL strategies with High School Laboratory Science" (PPT)
- Student Mini-Lectures (1-2 presentations) with critique/evaluation
- Interview question forum for Science teachers
- Issues in CP2 presentation of **question or problem** that will be addressed in CP 2 Preliminary report #1 (development of Case Study 2 Issue(s) (#15)

Next Time:

Prior to class in teams explore (to be assigned) one of the following websites or equivalent for a specific Science Extracurricular/Enrichment Activities and do a brief presentation to discuss them in class:

1. **Odyssey of the Mind= http://www.odysseyofthemind.com/ (note video)**
2. **Science Olympiad (San Diego and National Websites)= https://sandiegoso.org and http://www.soinc.org/**
3. **FIRST (Robotics)= http://www.usfirst.org/roboticsprograms/frc**
4. **Invention Convention=http://ge.geglobalresearch.com/inventionconvention**
5. **Science Fair (Marantha HS)=http://www.maranatha-hs.org/document.doc?id=1083 and https://docs.google.com/presentation/d/1iU0KPQk0aP8lhpmnWsBIESlftGpNSGqHN1RoA23wxLE/edit?pref=2&pli=1#slide=id.p (Powerpoint workshop on implementing San Diego Science Fair)**

#6 March 29 (Thursday) Themes: Extra-curriculum Strategies in Science

- Discussion/Presentation of Webpage information and overview of curricular and extracurricular science activities: FIRST, Science Olympiad, Odyssey of the Mind, Science Fair and Invention Convention as additional models of Inquiry based learning (some modeling and practice in implementing these)
- Short term problems for OM (in class: Superlinks and (or) Verbal/Non-Verbal Communication
- Assign teams for presentation of "Invention Convention" or OM. Use Google docs to share ideas (formative tasks) with colleagues and instructor. Assignment #10 Presentations due: Invention Convention or OM (in Class #9
- Keating Mini-Lecture #4 "How to maximize effective cooperative learning in a Science Classroom"
- Mini Lecture X 1
- Interview Questions Forum

Review Assignments for Next Class:

- Case Study Preliminary Presentation #2: Baseline data for proposed study and potential action plans due Class #8
- Continue to work on team presentation for Invention Convention for Class #9.
- Create modified SDAIE lab to compare to a traditional lab/ writeup Action Research Proposal (See Addendum A in Syllabus) for Class #8
- **Read and create a series of prompts (and respond to them)** that address the content of either Ch 10 (Learning in Middle and High School) or Ch 12 (Science Engineering and Societal Issues) and send to EDMODO prior to class.
- Continue to work on Book Report for Class #10.
- Continue to work on Independent study project due last class #10.

#7 Independent Study Assignment #12 (To be completed independently any time during the semester and reported during class #10)

#8 April 12th Thursday Theme: Using Action Research as a Science Teacher (Case Study CP 2)

- Mini-Lecture presentations (1-2)
- Case Study Preliminary Presentation #2 Baseline data and potential action plans Assignment (#15). Send to EDMODO prior to class
- Preliminary overview/presentation of lab sheets for the SDAIE vs. Traditional lab (show draft for both) plus your Action Research Proposal for this study (see addendum A in syllabus)
- Send to EDMODO your own prompts and response to **<u>eithe</u>**r Ch 10 (Learning in Middle and High School) and or Ch. 12 (Science Engineering and Societal Issues)
- Interview Questions Forum

Review assignments for next class

1) Final report on SDAIE Lab Action Research Report (#7). Send to EDMODO prior to class.
2) Presentation of final group solutions for the Invention Convention
3) Preliminary discussion #3 on issues (CP2) #15: preliminary data from action plans. Send to EDMODO prior to class.

#9 April 12th (Thursday) Theme: Applying Enrichment and Extracurricular Programs to Science Teaching

- Preliminary report/discussion #3 on progress of Issues in Science Student teaching CP2 (#15): Preliminary data?
- Assignment #7 SDAIE vs. Traditional Lab (Action Research) Final Report/Presentation (See addendum A for format)
- Invention convention or OM team final presentations
- Keating mini-lecture #5: "Grant Writing Strategies for a Science Teacher" or other optional class
- Mini-Lecture presentations (final 1 or 2)
- Interview Questions Forum

Review assignments due for last class #10): (note: Field Trip to the Safari Park is next Class #2/#3 May 3rd see earlier on syllabus)

- Complete Independent Study/Open date assignment (#12) and send report to EDMODO prior to class.
- Continue to gather data for Issues in Science Teaching Final report #15 (See syllabus addendum C for Case Study format) due last class or later.
- Book report written and oral presentation (overview and application to teaching). Send to EDMODO prior to class.
- Final Exam due Graphic Organizer of Spring Semester

#10 May 3rd (Thursday) Theme: Using the Case Study Model of Action Research to assist in Solving Problems in Science Teaching

- Final Report: Issues in Science Student Teaching CP2. Assignment #15
- Independent Study presentation #12
- Book report presentations
- Interview Questions Forum
- Final exam due "Create a Graphic Organizer of Second Semester Course"
- Keating mini-lecture #6 "Brain Research and how it informs Science teaching Pt. 2" (Brain Institute Conference and Brain Literature)
- Instructor evaluations

Addendum A (Action Research Design Proposal/Final Report: Use with Assignment #7 SDAIE Lab (Similar to Case Study (with a more formal approach)

Action Research Project Design Proposal Plan

Purpose:

1) To apply the principles of action research in a teacher directed and designed project.
2) To model the concept of the teacher as a researcher.

Design Plan

Problem: (specifically what question(s) are you posing)

Information: (what are potential sources of background information related to your question(s). This literature review of your topic can assist you in more formally organizing both your questions and as a basis for formulating your research design. Although it is not part formally a part of this assignment to include this you have done a lot of informal background reading and discussion to inform you related to this topic.

Hypothesis: (based on background information and what do you predict will be the answer to the question). This may be stated in the form of a null hypothesis (ex. there will be no difference between method A and B in learning science concepts) or research question format (ex. students will learn science concepts better when using method A). Remember it is not so important that the data supports or refutes the hypothesis but rather that it (data) accurately justifies your conclusions.

Experimental Design: This section should include an overview describing **the nature of the type of research study** i.e. quantitative, qualitative (or both) as well as the general procedures which will guide you such as: any materials, instruments and techniques utilized **to gather data**; the **subjects** which will be the focus of the study; **time frame** for conducting the study; and methods used to **analyze data.** Remember to explain how you will attempt to control the critical variable of researcher effect with **triangulation techniques (multiple sources of data to evaluate your study** (since in many cases you will be both the teacher and the researcher).

Data/Results: How will the data be represented? For example, will a journal be used, data tables constructed and or graphs produced? If statistical analysis, please specify.

Conclusions/Implications: Is the analysis of your data support, refute (or yield inconclusive results) related to your hypothesis? What inferences could you draw from the conclusions? What additional questions and research might your results suggest? What potential implications might your findings suggest (for your classroom or for learning and teaching in general)?

Note: **Final Report** should include a 250 word + or- - 1) **Abstract (overview); 2) Body consisting of brief discussion of each of the elements of the design plan**

Addendum B (Case Study Preliminary and Final Reports)

Case Study (Action Research) Considerations for Assignment #15 Issues in Student Teaching

A case study is a formal but dynamic strategy of teacher led research (action research) that uses a collaborative process to problem solves some issue in education (in this case science education). Some generalized steps should include at a minimum at least the following preliminary steps leading to a final report:

1) **Identify a problem (Preliminary Report #1) what factors are inhibiting your ability to teach or the students' ability to learn.** ***It may take many forms such as: infrastructure: I room is too small to have laboratory type exercises; management: one of my students will not do any homework; teaching materials: I have no lab manuals and little materials; teaching strategies: I do not know how to deal academically with such a wide range of abilities in my class. ETC.***

2) **Brainstorm possible solutions i.e. Action Plans (treatment) and Data Collecting methods (*Preliminary Report #2)* based on general knowledge from classes, readings, master teachers and prior experiences. After you have discussed the issue with your colleagues and instructor get feedback and suggestions from them.** ***Ex. From infrastructure problem: swap rooms with another science teacher one day a week when they are not using the lab. This should be coordinated with the principal and based on state mandated requirements for safety in science laboratories. In terms of data collecting I would: observe student behavior in lab classroom compared to the regular; use a focus group of students discuss their perspective of this new space; compare results of lab/test scores pre and post this treatment.***

3) Propose an action plan with specific actions and a timeline (includes collecting baseline data*) Preliminary report #2*

Observe behavior, collect test scores etc. prior to changing rooms. For three weeks with plenty of warning to the students change rooms to use the lab. Identify additional problems this may create and propose changes. Use the baseline data to compare to data after the treatment. Note limiting and delimiting factors.

4) Ongoing collection of data from observations and responses to your plan Preliminary Report #3. Not you may decide to drop or add specific action plans based on preliminary findings.

Students took an extra five minutes to get to this lab so I said if they were on time this would result in a bonus of 5 pts on their lab report for at least the first three weeks. Also noted: there were less behavioral issues and more time on task. Lab scores increased 10% all compared to baseline data. Will see if it is possible to use twice a week.

5) Final Report should include discussion of 1-4 above in addition to the summary of the outcomes and implications from the findings of the Case Study. What were the successes and the challenges to the plan? What would you do in the future (steps) to improve on it? What have you learned from the study?

I would request an adequate lab space from the principal or whoever schedules a year prior. I would make a recommendation on which room might be a good fit for my curriculum and point out the state requirement for adequate space and safety for laboratory based science classes. I will make these recommendations supported by my final report, which included less classroom management issues, and higher achievement compared to baseline data.

Addendum C Spring Grade Sheet

Name:
Assignment Number/topic

#1 Attendance (5pts each date) 50pts total

#2 Science text reading prompts/responses on EDMODO (9 pts X 5 = 45 Pts.
Ch. 9 (Diversity)___Ch. 11 (Lectures)_____ Ch13 (Lab and Field Work)_____Ch. 15 (Computers and Ed Tech)
Ch. 10 or Ch. 12 (Create own prompts and address them) (choice)_____

4 Presentation/Evaluation of Science Website (10 pts)

#5 Presentation/Evaluation of technology tool/software (10 pts)

#7 Action Research Study on Effectiveness of SDAIE vs. Traditional Lab Experiences (10 prelim (labs +action research proposal + 25 final)= (35 pts)

#10 Enrichment and Extracurricular activities in Science (40 pts.)

- Team presentations of overview of various programs (10 pts)
- Preliminary Problems for OM= 10 pts
- Preliminary (10 pts) and final presentation (10 pts) for Invention Convention (20 pts)

#11 Book Report on Science reading (oral and written reports) = 10 pts

12 Independent Study at formal or informal science event (Report) (10 Pts)

#13 Attendance and participation on Science Field Trips (Safari Park and Beckman Center) (20 pts)

#14 Mini-Lecture on science topic (25 pts)

#15 Issues in Science Teaching (Case Study) Three Preliminary Reports (15 pts) and Final (20 pts.)= 35 pts total

Actual/Total Possible: 305

Extra Credit (10 pts possible)=

Assignments #1 (50 pts); #2 (45 pts.) #4 (10 pts); # 5 (10 pts.); #7 (35 pts.) #10 (40 pts.); #11 (10 pts.); #12 (10 pts.); #13 (20 pts.); #14 (25 pts.); #15 (35 pts.) = 290 pts