RUTGERS
Graduate School of Education

Learning and Teaching
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Rutgers, The State University of New Jersey
15:256:554:01 Science in the Elementary School
Spring 2016
Wednesdays 4:50-7:30 p.m.
GSE-25A

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Mode of Instruction: ___ Lecture _X_ Seminar ___ Hybrid ___ Online ___ Other	Permission required: __ No _x_Yes Directions about where to get permission numbers: from the instructor

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Course Description

New Jersey Professional Standards for Teachers 2014[1]

1. Standard One: Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.

i. Performances:

(1) The teacher regularly assesses individual and group performance in order to design and modify instruction to meet learners' needs in each area of development (cognitive, linguistic, social, emotional, and physical) and scaffolds the next level of development;

ii. Essential Knowledge:

(1) The teacher understands how learning occurs--how learners construct knowledge, acquire skills, and develop disciplined thinking processes--and knows how to use instructional strategies that promote student learning;

[1]http://www.state.nj.us/education/code/current/title6a/chap9.pdf

2. Standard Two: Learning Differences. The teacher uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.

i. Performances:

(3) The teacher designs instruction to build on learners' prior knowledge and experiences, allowing learners to accelerate as they demonstrate their understandings

ii. Essential Knowledge:

(2) The teacher understands and identifies differences in approaches to learning and performance and knows how to design instruction that uses each learner's strengths to promote growth;

(5) The teacher understands that learners bring assets for learning based on their individual experiences, abilities, talents, prior learning, and peer and social group interactions, as well as language, culture, family, and community values

iii. Critical Dispositions:

(1) The teacher believes that all learners can achieve at high levels and persists in helping each learner reach his or her full potential;

(3) The teacher makes learners feel valued and helps them learn to value each other;

3. Standard Three: Learning Environments. The teacher works with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self-motivation.

i. Performances:

(3) The teacher collaborates with learners and colleagues to develop shared values and expectations for respectful interactions, rigorous academic discussions, and individual and group responsibility for quality work

(4) The teacher manages the learning environment to actively and equitably engage learners by organizing, allocating, and coordinating the resources of time, space, and learners' attention;

ii. Essential Knowledge:

(2) The teacher knows how to help learners work productively and cooperatively with each other to achieve learning goals;

(3) The teacher knows how to collaborate with learners to establish and monitor elements of a safe and productive learning environment including norms, expectations, routines, and organizational structures;

iii. Critical Dispositions:

(2) The teacher values the role of learners in promoting each other's learning and recognizes the importance of peer relationships in establishing a climate of learning;

(3) The teacher is committed to supporting learners as they participate in decision-making, engage in exploration and invention, work collaboratively and independently, and engage in purposeful learning; and

(4) The teacher seeks to foster respectful communication among all members of the learning community

[2]http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

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Council for the Accreditation of Education Professionals (2013)[2]

Standard 1: Candidate Knowledge, Skills, and Dispositions

1.1 Content Knowledge and Pedagogical Knowledge

1.2 Instructional Practice

- Learning Experiences

Course Catalog Description:

This course presents science as an integrated body of knowledge using investigative and inquiry techniques. Thematic or problem-based approach to science teaching. Impact on the elementary school of new developments in science and new refinements in the teaching of science; emphasis on content, method, material, and general curricular implications.

Other description of course purposes, context, methods, etc.:

The goals of the course include the following:

- As future teachers, students will be introduced to hands-on experiences that encourage them to teach science topics that are appropriate for elementary level students, and can be modified for diverse learners.
- Together as a class, we will consider ways that selected topics in the physical, life and earth systems sciences can be presented to students at the pre-school through elementary level. We will also consider how these topics influence everyday life.
- Students will be introduced to, and have the opportunity to use, pedagogical techniques that foster inquiry approaches to science teaching.
- Students will become familiar with the National Science Standards including the Next Generation Science Standards (NGSS) with emphasis on science practices and content, and consider how fields such as literacy, language arts and mathematics can be integrated into science lessons and/or units.
- Together as a class, we will consider ways to enhance elementary student learning outcomes using research based approaches.

Class materials each student needs to have/buy/bring to class:

- Additional readings (will be available on the course website, save a copy on your computer or print)
- Next Generation Science Standards (save a copy on your computer)
- New Jersey Core Science Standards (save a copy on your computer)

Grading and Activities

Your course grade will be based on several different items. This syllabus offers an outline of the items, however it is not set in stone and adjustments may be made throughout the semester in order to meet our needs. You will be informed of any changes either in class or by email. Hard work, attendance to all classes, completion of all the assignments, participation in class activities/discussions and resubmission of the assignments are all factors considered for the attribution of the final grade for this course. To obtain full credit for any academic task, each student must show signs of dedication to extending his/her scientific knowledge as well as

[2]http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

constant academic effort aimed toward improvement and individual scientific knowledge and skills development. The more work you dedicate to the course, the more you will get out of it. Below is an outline of class activities. The goals of this course are to learn and practice techniques for teaching and transition from student to teacher and each assignment is designed to help you meet these goals. **Therefore, each assignment can be improved by submitting the assignment again, and I encourage you to do so**. After you submit each assignment it will be scored and feedback may be provided (depending on assignment). Once the assignment is returned to you, you may then work to improve it. All resubmissions are due before the next class after the work is returned.

Activities points	
Pre-reflection and final reflection	20 (10 points each)
Weekly checkpoints	15 (averaged)
Quizzes	10 (averaged)
Lesson Play (2 times throughout the semester)	20 (10 points each)
Lesson Plan (2 times throughout the semester)	20 (10 points each)
Unit Plan with assessment	15
Total	**100**

The grade breakdown is as follows:

A – 90 - 100
B+ - 85 - 90
B – 80 - 85
C+ - 75 - 80
C – 70 - 75
D – 65-60

[2]http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

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Description of Activities

Participation in class discussions:
Class work will be primarily group work. You will work to explore and learn various components of science that is often taught at the elementary and middle school level. At the same time you will learn how students construct similar concepts. We will also discuss the readings that you will do at home.

Try not to miss any class meetings because it will be difficult (almost impossible) to learn the material on your own. You are welcome to express opinions you have and ask questions regarding the materials but make sure this is done in a respectful and professional manner. You are expected to show up, contribute to discussions, use technology for classwork, and stay off you cell phone while in the classroom. If you need to miss class for any reason, please email me as soon as possible. Unsatisfactory participation and **any** unexcused absences will negatively affect your course grade.

Weekly Checkpoints:
Each week you will complete a homework assignment related a course topic. Most weeks, you will be responsible for explaining what you learned in terms of content and pedagogy and providing examples to support your explanations. Each week, the homework is due on **Tuesday** by midnight. It should be **submitted to Google Classroom as a Google Doc**. Once it is reviewed, you will receive feedback. You may be asked to do revisions. Revisions are due by the following class.

Quizzes:
At the beginning of some classes, you will take a short quiz. Each quiz will address one or more standards and be related to science content and/or pedagogy for teaching. You will receive the scored quiz by Wednesday. It is your responsibility to make any corrections to the quiz and resubmit it by the next class. If you have any questions regarding your quiz, you should schedule time to discuss it during office hours.

When resubmitting an assignment, you must do three things:

1) Identify the difficulty you had.
2) Provide a new answer.
3) Explain why this answer is correct.

Lesson Plays:
Two times throughout the semester, you will be asked to write a lesson play. This assignment is designed to get you to consider the dialogue through which you will engage students in thinking about and practicing science and to consider how your students' thinking will be expressed and guided through interactions with peers and with the teacher. Additional directions for these assignments will be given in class.

[4]http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

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Unit Plan:
You will be required to create a unit plan with a final assessment (rubric, test, or performance task). You will include as many lessons as are necessary to comprehensively teach the concepts within the unit (including revised Lesson Plans). You will select your unit topic from the NJ DOE's Science Model Curriculum (http://www.state.nj.us/education/modelcurriculum/sci/) and use the Next Generation Science Standards (http://www.nextgenscience.org/next-generation-science-standards) to learn more about each standard. More information will be provided in class.

Lesson plans and teaching:
You will compose two lesson plans of elementary school length (approximately 30 minutes) for this course. One will be delivered in class. These lessons will be composed in the GSE format (with some modifications). Both will be present in the Unit Plan.

Pre-reflection and final paper:
At the beginning of the course, you will write a reflection (approximately 2-3 double spaced pages) about your experiences with learning science. Upon completion of the last class, you will write a final reflection (approximately 4-5 double spaced pages in length) in which you will describe your philosophy of teaching science and how your philosophy has changed throughout the semester.

Check your e-mail & Google Classroom regularly. I will use Google Classroom to make class announcements and e-mail to contact you individually. You will need to pay attention to these announcements/emails in a timely fashion. If you do not usually use your Rutgers e-mail account, be sure that you have set it to forward to the account that you do check.

Week	**Teaching Science Pedagogical Topic**	**Science Content Topic/Guiding Questions**	**Readings** (Readings are aligned with the week's content and should be read prior to class.)
1	Course Introduction The Nature of Science & The Goals of Science Education The Structure of Scientific Knowledge	***Doing* Science** Content-related: How can scientific models be used to understand students' thinking? Pedagogical: How can teaching practices facilitate opportunities for students to think like scientists?	Syllabus
Physical Science			
2	Standards	**Matter** Content-related: How can	Michaels, et al. *Ready, Set, Science!* Chapter 1

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	Learning Progressions Scientific Modeling	evidence be used to construct ideas? Pedagogical: How teachers help students reason through scientific problems? What are learning progressions?	Cummins, *Reading About Real Scientists* Duncan & Cavera, *DCIs, SEPs, and CCs, Oh My!* *NGSS K-2, 3-5 Storylines* **Pre-Course Reflection Due** **CHOOSE UNIT TOPIC** **NJ Department of Education: Model Curriculum** http://www.state.nj.us/education/modelcurriculum/sci/
3	Inquiry Based Instruction (Guided Inquiry)	**Sinking/Floating** Content-related: In what ways do variables in scientific investigations affect the results? How can/why should variables in scientific investigations be controlled? Pedagogical: How can teachers facilitate students' understanding of subject relevancy? How can science be integrated with other subjects? How can inquiry create opportunities for student-generated experimentation?	Colburn, *An Inquiry Primer* Michaels, et al. *Ready, Set, Science!* Chapter 4 Lott & Wallin, *Modeling the States of Matter in a 1st Grade Classroom* Danielson, *Framework for Teaching: Domain 2a&b*
4	Learning Progressions Science & Engineering Practices	**Motion** Content-related: What can be learned from the development and testing of different investigation designs? Pedagogical: How can teachers merge science content with science practices?	Marshall, *In Step with the New Science Standards* Reiser, Berland, & Kenyon, *Science & Engineering Practices* Danielson, *Framework for Teaching: Domain 1a-e* **Unit NGSS Identified & Unit Resources (minimum of 4 sources)**
5	Evaluating & Modifying Pre-made Plans	**Dynamics** Content-related: How can observing and measuring patterns of phenomena	Wiggins & McTighe, *Understanding by Design Framework* Hus & Aberšek, *Questioning as a Mediation Tool*

[2]http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

		help to predict future occurrences? Pedagogical: How do questions facilitate learning? How do teachers assess during learning?	Danielson, *Framework for Teaching: Domain 3b*
Earth Science			
6	Unit Planning: Goal Setting, Objectives, & Assessment Alignment Question Types/Techniques	**Light** **Night and Day** Content-related: How can 3D models be used to investigate scientific phenomena that cannot be explored through experimentation? Pedagogical: How can content and practice be integrated through goal setting? How does creating models influence students' thinking?	Windschitl, *Why We Can't Talk to One Another About Science Education Reform* Michaels, et al. *Ready, Set, Science!* Chapter 6 *KLEWS to Explanation-Building in Science*, Hershberger & Zembal-Saul
7	Evaluation & Assessment	**Phases of the moon** Content-related: How can 3D & 2D models be used to investigate scientific phenomena that cannot be explored through experimentation? Pedagogical: How can student generated questions guide instruction?	Johnson, Uline, & Perez, *The Quest for Mastery* Danielson, *Framework for Teaching: Domain 1f & 3d* **Lesson Play 1 Due**
8	Evidence	**Seasons** Content-related: How can the examination of evidence help students to understand science? Pedagogical: How can you differentiate instruction for a diverse student population?	Michaels, et al. *Ready, Set, Science!* Chapter 2 Plummer, Davis, & Brazier, *Linking Science & Literacy* Mulvey & Warnock, *Animal Detectives* **Unit Plan Outline (Essential Questions, Overarching Concepts, & Formative Assessments)**

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Life Science			
9	FOSS Kits	**Seeds** Content-related: How can observations plants and animals be used to classify/organize them? Pedagogical: How can you make prepackaged science programs more inquiry-based?	Bryce, *Meeting the Reading Challenges of Science Textbooks in the Primary Grades* **Lesson Plan #1 Due**
10	Teaching Diverse Learners/Scientific Models	**Genetics and Heredity** Content-related: What can observations and analysis of animals' observable traits tell about the relationships among animals and their environments? Pedagogical: What should science teachers consider when choosing resources to support students' learning?	Kohn, *The Case Against Grades* Forbes, et al., *Using Models Scientifically*
11	Reflection & Metacognition: Self-Reflection and Student to Teacher Reflection	**Energy** Content-related: What kinds of resources/evidence should scientists use to examine how scientific phenomena? Pedagogical: In what ways can cross-cutting concepts be revisited in different disciplines?	Sterling & Hargrove, *How Healthy Is Our Pond?* Danielson, *Framework for Teaching: Domain 4* **Scientific Model Lesson Play #2 Due**
12	Authentic Instruction and Assessment	**Engineering** Content-related: How can knowledge and understanding of scientific phenomena be used to solve authentic science- and engineering-based problems?	Tank, Moore, & Strnat, *Nature as Inspiration* **Lesson Plan #2 Draft Due to Conference with instructor**

[2]http://caepnet.files.wordpress.com/2013/09/final_board_approved1.pdf

		Pedagogical: How can students practice authentic application of science content, practices, and engineering skills?	
13	Teacher Evaluation	**Teaching Day 1**	**Unit Plan Due**
14	Teacher Evaluation	**Teaching Day 2**	**Lesson Plan #2 Due After Model Lesson**
15			**Final Reflection Due**

Academic Integrity

Academic integrity is essential to the success of the educational enterprise and breaches of academic integrity constitute serious offenses against the academic community. Every member of that community bears a responsibility for ensuring that the highest standards of academic integrity are upheld. Only through a genuine partnership among students, faculty, staff, and administrators will the University be able to maintain the necessary commitment to academic integrity.

The University administration is responsible for making academic integrity an institutional priority and for providing students and faculty with effective educational programs and support services to help them fully understand and address issues of academic integrity. The administration is also responsible for working with other members of the academic community to establish equitable and effective procedures to deal with violations of academic integrity.

For further information, visit http://academicintegrity.rutgers.edu/.

Violations of Academic Integrity

Any involvement with cheating, the fabrication or invention of information used in academic exercise, plagiarism, facilitating academic dishonesty, or denying others access to information or material may result in disciplinary action being taken at either the college or university level. Breaches of academic integrity can result in serious consequences ranging from reprimand to expulsion.

http://senate.rutgers.edu/FinalInterimAcademicIntegrityPolicy.pdf

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