

Rutgers, The State University of New Jersey

15:256:554:01 Science in the Elementary School

Spring 2015

Wednesday, 4:50-7:30

GSE, 025a

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Phone Number : 732-672-9432	Location: GSE 025a
Office Hours: By appointment	Prerequisites or other limitations: <i>Admission to the Teacher Education Program</i>
Mode of Instruction: <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Hybrid <input type="checkbox"/> Online <input type="checkbox"/> Other	Permission required: <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes Directions about where to get permission numbers:

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentations: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Course Description

Learning goals:

The learning goals of this course are that you, as future teachers, should eventually be able to:

- Plan science lessons, units and learning sequences
- Collaborate with other students to evaluate, modify and try already made science lessons
- Design and implement science lessons using inquiry-based teaching
- Become familiar with the NGSS (including framework, crosscutting concepts and organization).
- Develop content knowledge, skills, as well as scientific attitudes in ALL scientific areas (physical sciences, life sciences, earth and planetary sciences, application and engineering).
- Critically reflect on your teaching in order to improve it.
- Develop critical reflection skills
- Provide proper feedback to others so that they can improve their teaching

New Jersey Professional Standards for Teachers (2014)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.

Performances:

- (1) The teachers 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

Essential Knowledge:

- (1) The teacher understands how learning occurs – how learners construct knowledge, acquire skills and develop disciplined thinking processes - and knowledge how to use instructional strategies that promote student learning
- (2) The teacher understands that each learner's cognitive, linguistic, social, emotional and physical development influences learning and knows how to make instructional decisions that build on learners' strengths and needs
- (4) The teacher understands the role and impact of language and culture in learning and knows how to modify instruction to make language comprehensible and instruction relevant, accessible and challenging.

Critical Dispositions:

- (2) The teacher is committed to using learners' own strengths as a basis for growth and their misconceptions as opportunities for learning
- (3) The teacher takes responsibility for promoting learners' growth and development

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.

Performances:

- (1) The teacher designs, adapts and delivers instruction to address each student's diverse learning strengths and needs and creates opportunities for students to demonstrate their learning in different ways
- (3) The teacher designs instruction to build on learners' prior knowledge and experiences, allowing learners to accelerate as they demonstrate their understandings

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

Critical Dispositions:

¹ <http://www.state.nj.us/education/code/current/title6a/chap9.pdf>

- (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.

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.

Performances:

- (2) The teacher develops learning experiences that engage learners in collaborative and self-directed learning and that extend learner interaction with ideas and people locally and globally

Essential Knowledge:

- (1) The teacher understands the relationship between motivation and engagement and knows how to design learning experiences using strategies that build learner self-direction and ownership of learning.

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

Standard Four: Content Knowledge. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches, particularly as they relate to the Common Core Standards and the New Jersey Core Curriculum Content Standards and creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to assure mastery of the content.

Performances:

- (1) The teacher effectively uses multiple representations and explanations that capture key ideas in the discipline, guide learners through learning progressions, and promote each learner's achievement of content standards;
- (4) The teacher stimulates learner reflection on prior content knowledge, links new concepts to familiar concepts, and makes connections to learners' experiences;

Essential Knowledge:

- (1) The teacher stimulates learner reflection on prior content knowledge, links new concepts to familiar concepts, and makes connections to learners' experiences;
- (3) The teacher stimulates learner reflection on prior content knowledge, links new concepts to familiar concepts, and makes connections to learners' experiences;

Standard Six: Assessment. The teacher understands and uses multiple methods of assessment to engage learners in examining their own growth, to monitor learner progress, and to guide the teacher's and learner's decision-making.

Performances:

- (1) The teacher balances the use of formative and summative assessment as appropriate to support, verify, and document learning;

Essential Knowledge:

- (1) The teacher understands the differences between formative and summative

applications of assessment and knows how and when to use each;

Standard Seven: Planning for Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

Performances:

- (1) The teacher individually and collaboratively selects and creates learning experiences that are appropriate for curriculum goals and content standards, and are relevant to learners;
- (3) The teacher develops appropriate sequencing of learning experiences and provides multiple ways to demonstrate knowledge and skill;

Essential Knowledge:

- (1) The teacher understands content and content standards and how these are organized in the curriculum;
- (3) The teacher understands learning theory, human development, cultural diversity, and individual differences and how these impact ongoing planning;

Standard Eight: Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

Performances:

- (2) The teacher continuously monitors student learning, engages learners in assessing their progress, and adjusts instruction in response to student learning needs;
- (4) The teacher varies his or her role in the instructional process (for example, instructor, facilitator, coach, and audience) in relation to the content and purposes of instruction and the needs of learners;

Essential Knowledge:

- (3) The teacher knows when and how to use appropriate strategies to differentiate instruction and engage all learners in complex thinking and meaningful tasks;

Council for the Accreditation of Education Professionals (2013)²:

Standard One: Content and Pedagogical Knowledge

1.1 Candidates demonstrate an understanding of the 10 InTASC standards at the appropriate progression level(s)² in the following categories: the learner and learning; content; instructional practice; and professional responsibility.

- Learner Development
- Learning Environments
- Content Knowledge
- Application of Content
- Instructional Strategies

Course catalog description:

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

Science in the Elementary School (3 credits): 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.

Required texts:

- 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 policy:

Evaluation of Written Work:

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 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
• Lesson Plan	10
• Unit Plan with assessment	15
• Teaching and teaching preparation	10
• Pre-reflection and final reflection	15
• Weekly assignments	15
• Lesson Plays (2 times throughout the semester – 10 points each)	20
• Weekly Quizzes	10
• Science Surveys	5
<hr/> Total	<hr/> 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

Academic Integrity Policy:

Any violation of academic honesty is a serious offense and is therefore subject to an appropriate penalty. Refer to <http://academicintegrity.rutgers.edu/integrity.shtml> for a full explanation of policies.

Course Requirements

Attendance Policy: You are expected to attend every class, however I understand that emergencies may arise. If you need to miss class for any reason, you need to email *prior* to the class that you are going to miss and let me know. We will then work out a mutual time for us to meet so that you can make up what you missed. Each unexcused absence will result in the lowering of your course grade by half a letter grade.

Summary of Requirements

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 any opinion you have, and ask any questions regarding the material but make sure this is done in a respectful and professional manner. You are expected to show up and contribute to discussions. 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.

Lesson Plays: Twice throughout the semester, you will be asked to write a lesson play for a prompt given in class. Full directions for this assignment will be given in class.

Quizzes: At the beginning of each class, you will take a short quiz. Each quiz will address one or more standards and be related to science content. You will receive the your scored quiz by email by Monday. 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, we can talk about 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

Weekly homework assignment: Each week you will be required to complete a reflection on the class. These reflections will be emailed to me by Sunday at noon. In addition to the reflections, additional assignments may be assigned.

Lesson plan and teaching: Once toward the end of the semester you will work in pairs to teach a lesson of elementary school length (approximately 30 minutes) on a topic that you select with guidance from the instructor. You will create a lesson plan, teach then lesson and then revise the lesson plan after receiving feedback from your classmates and the instructor. The final lesson plan will be in the GSE format (with some modifications) and will be posted on the course website so that your classmates can use it.

Unit Plan: You will be required to create a unit plan with final assessment. More information will be provided in class

Pre-reflection and final paper: At the beginning of the course, you will be asked to write a reflection on your experiences with learning science. Upon completion of the last class, you will write a final reflection in which you will describe your philosophy of teaching science, and how your philosophy has changed throughout the semester. This paper should be approximately 4-5 pages in length and submitted by Sunday following the last class

Course Schedule by Week

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	What is a scientist? What is science? What are the methods involved in scientific experimentation?	Syllabus
2	Standards Learning Progressions	Measurement Relations Between Variables	Cummins, <i>Reading About Real Scientists</i> Miele, <i>Using Draw-a-Scientist Test for Inquiry and Evaluation</i> <i>NGSS K-2, 3-5 Storylines</i>
3	Inquiry Based Science Teaching	Motion	Colburn, <i>An Inquiry Primer</i> Danielson, <i>Framework for Teaching: Domain 2a&b</i>

4	Goal Setting Objective & Assessment Alignment	Dynamics 1	Danielson, <i>Framework for Teaching: Domain 1a-e</i> Marshall, <i>In Step with the New Science Standards</i> Roseman & Koppal, <i>Aligned or Not?</i>
5	Question Types & Techniques	Dynamics 2	Danielson, <i>Framework for Teaching: Domain 3b</i> Hus & Aberšek, <i>Questioning as a Mediation Tool</i>
6	Lesson Plans: Evaluating Modifying Pre-made Plans	Light Night and Day Phases of the moon	Windschitl, <i>Why We Can't Talk to One Another About Science Education Reform</i>
7	Evaluation & Assessment	Seasons Solar System (Teaching 1)	Danielson, <i>Framework for Teaching: Domain 1f & 3d</i>
8	Assessment Design	Ecosystems (Teaching 2)	Plummer, Davis, & Brazier, <i>Linking Science & Literacy</i> Wendell & Rogers, <i>Engineering Design-Based Science, Science Content Performance, and Science Attitudes in Elementary School</i>
9	Unit Plan Design Sequencing	Genetics and Heredity	Wiggins & McTighe, <i>Understanding by Design Framework</i>
10	Teaching Diverse Learners	Cycle Types of Rocks (Teaching 3)	Bryce, <i>Meeting the Reading Challenges of Science Textbooks in the Primary Grades</i> Cunningham & Higgins, <i>Engineering for Everyone</i>
11	Reflection & Metacognition: Self-Reflection and Student to Teacher Reflection	Model of the interior of the Earth Earthquakes Tectonics	Danielson, <i>Framework for Teaching: Domain 4</i>
12	Using Technology	Magnetism (Teaching 4)	
13	Teacher Evaluation	Electrostatics	AchieveNJ: NJ Department of Education http://www.nj.gov/education/AchieveNJ/

14	Q & A Session Portfolios Interviews Resumes	Circuits	
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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>

References

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