Wilmington University  
College of Education  
Bachelor of Science Elementary Education (Grades K-6)

Course Number: EDU 404

Course Title: Integrated Methods to Teaching Elementary Science (3 Credits)

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Course Description: Students participate in an analysis of methods and materials used in contemporary science programs, with a focus on the current state and national content standards for science. Emphasis is on process skills, concepts, schema, attitudes, and values of science. The content portion includes life and environment, earth and space, and physical science. Each student is required to prepare a project that includes designing, delivering, and evaluating science lessons for elementary students. The integration of the lessons/units will focus on integrating the various science disciplines and on integrating the sciences with other major content areas. A virtual clinical experience from schools using "best practices" is included.

Minimum Time Requirements (in clock hours):

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<tr>
<th>Teacher Led Instruction</th>
<th>SEA</th>
<th>Fieldwork/Clinical</th>
<th>Lab</th>
<th>External Learning</th>
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<tr>
<td>35</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>70</td>
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</table>

College Education Program Attributes

The manner in which we prepare educational personnel is informed by eight essential attributes:

1. ensuring that programs are knowledge-based;
2. viewing educational personnel as learners, including a focus on deconstructing past experiences as learners in coursework and field experiences and developing appropriate knowledge of the content and discourse of the disciplines to be taught;
3. contextual and cultural sensitivity;
4. facilitating inquiry and reflection, i.e., providing structured opportunities for critical reflection on and taking action in one’s daily work;
5. enabling authentic participation, collegiality and collaboration;
6. building an ongoing developmental program that allows for continuous improvement, experimentation, and professional growth;
7. ensuring that programs are standards-driven; and
8. ensuring that programs promote the effective use of technology.

Program Standards: Interstate Teacher Assessment and Support Consortium (InTASC)

Technology Standards: International Society for Technology in Education (ISTE)

Specialized Professional Association Standards: Association for Childhood Education International (ACEI)

Wilmington University Graduation Competencies: Undergraduate Educational Competencies

Delaware Performance Appraisal System II: DPAS II Evaluation Rubrics
**Learning Methods:** A variety of teaching methods including inquiry–based learning, game-based learning, personalized learning, differentiated instruction, collaborative projects, and class participation will be used in a student-centered approach to learning. Candidates are encouraged to move from passive receivers of information to active participants in their own learning.

**Learning Outcome 1 - Designing Coherent Instruction** (ACEI 2.2, 3.1, 3.3, 3.4, 3.5, InTASC Standards 1, 4, 5, 6, 7, ISTE 5b, 5c, DPAS II Planning & Preparation)

- **Learning Activities/Performance Tasks:**
  1. Candidates evaluate various units utilizing a variety of frameworks for teaching.
  2. Design a unit of lessons to support the instructional goals to engage students in meaningful learning.
  3. Candidates align lesson sequence within the unit with both formative and summative assessments.

- **Assessment:** Candidates will evaluate existing teacher lessons, design and submit lesson plans, and create formative and summative assessments within the lesson.

**Learning Outcome 2 - Development of Pedagogical Content Knowledge** (ACEI 3.1, 3.3, 3.4, InTASC Standards 1, 4, 5, 6, 7, 10, ISTE 5b, 5c)

- **Learning Activities/Performance Tasks:**
  1. Candidates will develop pedagogy within the context of teaching science.
  2. Candidates display knowledge of the important concepts of formative and summative assessment design.
  3. Candidates will understand that different types of knowledge exist and how different knowledge applies and connects to the teaching of science.
  4. Candidates’ design reflects an understanding of scientific and engineering practices, disciplinary core ideas, and crosscutting concepts (NGSS hallmarks).

- **Assessment:** Candidates will conduct an in-class discussion of Bloom’s Taxonomy and collaboratively identify a variety of strategies to engage and motivate students in science.

**Learning Outcome 3 - Designing Learning Activities that are Highly Suitable for Diverse Learners [differentiated] and Support Instructional Outcomes.** (ACEI 2.5, 3.2, InTASC Standards 1, 2, 4, 5, 6, 7, 10, ISTE 5b, 5c)

- **Learning Activities/Performance Tasks:**
  1. Candidates design instruction with an understanding of students with exceptional needs, including those associated with disabilities and giftedness, and knows how to use strategies/resources to address needs.
  2. Candidates incorporate tools of language development into planning and instruction, including strategies for making science content accessible to English language learners and for evaluating and supporting their development of English proficiency.
  3. Candidates integrate digital-age tools purposefully to engage all learners in critical thinking and problem solving.
  4. Candidate incorporate the arts in a variety of ways making a clear contribution to learning.

- **Assessment:** Candidates will provide specific implications for instruction and assessment based on student individual differences and community, school, and classroom characteristics that may affect learning in a diverse classroom.
Learning Outcome 4 - Designing Student Assessment in Science (ACEI 4.0, InTASC Standards 1, 2, 4, 5, 6, 7, ISTE 7a, 7b)

Learning Activities/Performance Tasks:
1. Candidates are aware that students may have an individualized education program (IEP) and therefore diverse assessment needs may apply.
2. Candidates' proposed approach to assessment is fully aligned with the instructional outcomes in both content and process.
3. Candidates design the unit and lesson plans such that assessment results can be utilized to plan future instruction for individual students.

Assessment: Candidates will create an assessment plan that includes multiple assessment modes, both on going and summative, throughout the instructional sequence promoting intellectual, social, emotional, and physical development of each student.

Learning Outcome 5: Understanding Pedagogically Sound Approaches in Teaching the Nature of Science (ACEI 2.2, InTASC Standards 4, 5, 6, 7)

Learning Activities/Performance Tasks:
1. Candidates are aware that not one “scientific method” exists. Rather, many scientific methods are used depending on the research context.
2. Candidates will design units using several methodologies including inquiry and experimentation.
3. Candidates will understand what science is and is not (Science is a way of knowing)
4. Candidates will be aware of the influence of culture, politics, and society on science.

Assessment: Candidates’ use of content within the Unit is accurate. Focus of major concepts and inquiry to teach Science is congruent with the big ideas and the nature of Science.

Additional Course Information and Schedule of Class Activities will be posted on the course blackboard site

Assignments and Grading

1. Class Discussions
2. Lesson Plan Evaluation
3. Collaborative Project on Diversity
4. Creation of Lesson Plan Integrating Technology
5. Assessment Plan
6. SEA - Age-appropriate Science Unit

These required projects are briefly described in the “Learning Outcomes” section of the syllabus. Additional details and resources, including OERs, can be found on the Blackboard course site.

College of Education Attendance Policy:

In the College of Education, faculty must approve all requests for absences that are exceptions to the University policy. Vacations are not considered legitimate reasons for missing classes. Faculty must be contacted prior to class in all cases except valid emergencies. Failure to obtain approval for exceptions may result in lowering the final passing grade or assigning a FA (failure due to absence).

Students who have registered for a course and never attended the class at all will receive a grade of NA (never attended). Early departures and late arrivals will be cumulative toward class absences. It is the student’s responsibility to obtain and complete assignments on the due dates. Students who register and enter the course on the drop/add date have four days to complete the first week’s assignments.
Course Materials and Reading List:

1. **A Framework for K–12 Science Education** The National Research Council’s *Framework* provides the sound, evidence-based foundation for the NGSS by drawing on current scientific research and identifies the science all K–12 students should know.


3. *Guide to Implementing the Next Generation Science Standards* A document from the National Research Council that provides recommendations for implementing the NGSS in states, districts, and classrooms.


5. *How to Read the Next Generation Science Standards* This provides an overview on how to read the standards.


9. *The Next Generation Science Standards*


Understanding Learning - Links

- [Blueprint for Personalized Learning in Delaware](#)
- [Bloom’s Taxonomy](#)
- [Classroom Management](#)
- [Group work: Using cooperative learning groups effectively](#)
- [Increasing Inclusivity in the Classroom](#)
- [How People Learn](#)
- [Metacognition](#)
- [Mindfulness in the Classroom](#)
- [Motivating Students](#)
- [Personalized Learning](#)
- [Substitution Augmentation Modification Redefinition Model](#)
- [Technological Pedagogical And Content Knowledge](#)
- [Teacher Toolbox](#)
- [Visual Learning](#)
Supporting Resources

The nature of science is included in the Next Generation Science Standards. The basic understandings about the nature of science are:

- Scientific Investigations Use a Variety of Methods
- Scientific Knowledge is based on Empirical Evidence
- Scientific Knowledge is Open to Revision in Light of New Evidence
- Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena
- Science is a Way of Knowing
- Scientific Knowledge Assumes an Order and Consistency in Natural Systems
- Science is a Human Endeavor
- Science Addresses Questions about the Natural and Material World


Structuring External Assignment: Planning and Preparation

Using the Wilmington University Unit Plan Format found within the Lessons, Units and Rubrics Tool on Taskstream, and the Next Generation Science and Common Core Standards, the teacher candidate will complete and submit an age-appropriate unit of lesson plans which includes a variety of methods and materials to teach Science across content areas, including the application of critical thinking and problem-solving skills. The thematic Unit of lessons must address cultural differences, different developmental levels, different learning styles and ability levels. It must also include both formative and summative assessment strategies, and digital-age learning experiences to plan, evaluate and strengthen instruction that will promote continuous intellectual, social, emotional, and physical development of each elementary student. The teacher candidate will facilitate a lesson from the Unit to demonstrate the teaching of science, to build student understanding for personal and social applications, and to convey the nature of science. Candidate must also incorporate, as appropriate, the performing arts (dance, music, theater) and the visual arts as primary media for communication, inquiry, and engagement among elementary students within the planned unit.

### EDU 404 - Planning and Preparation

<table>
<thead>
<tr>
<th>ACEI 2.2 Science</th>
<th>Unsatisfactory</th>
<th>Emerging</th>
<th>Basic</th>
<th>Proficient</th>
<th>Distinguished</th>
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<tr>
<td>Candidates know, understand, use fundamental concepts of physical, life, and earth/space sciences. Candidates can design and implement age-appropriate inquiry lessons to teach science, to build student understanding for personal and social applications, and to convey the nature of science;</td>
<td>Lessons are not explicitly linked to learning goals. Learning activities, assignments and resources are not aligned with standards. Not all learning goals are covered in the design.</td>
<td>The learning goals are present; however, they are vague and not aligned with the standards or assessments in the use of Science.</td>
<td>Lessons and assessments are appropriately developed; however, more subtle elements of teaching Science are ignored.</td>
<td>Lessons and assessments are aligned with the Curriculum Standards in the use of Science.</td>
<td>Candidate's use of concepts to teach Science is appropriately used.</td>
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<tr>
<td>ACEI 2.5 The arts’</td>
<td>Activities and assignments do not appear productive and appropriate for each student.</td>
<td>A single approach utilizing the performing and visual arts is present; however, it is not fully integrated into learning.</td>
<td>Lessons and assessments appropriately incorporate the visual and performing arts; however, student engagement is not evident.</td>
<td>Use of the performing and visual arts is present and appropriate for elementary students.</td>
<td>Significant variety across instruction, activities, assignments, and/or resources linked to the visual and performing arts. This variety makes a clear contribution to learning.</td>
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<td>ACEI 3.1 Integrating and applying knowledge for instruction — Candidates plan and implement instruction based on knowledge of students, learning theory, connections across the</td>
<td>Planning for student learning is not aligned with learning goals and do not address students’ needs.</td>
<td>Planning for instruction is present; however, knowledge of students was not considered in the design.</td>
<td>An attempt is made to use student-learning profiles to support planning for instruction.</td>
<td>Skilled use of planning for instruction using knowledge of students. Connections to curricular goals are</td>
<td>Most instructional decisions are pedagogically sound (i.e., they lead to student learning). All lessons within the unit are logically organized and are useful in moving students</td>
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<td>Curriculum, curricular goals, and community.</td>
<td>Unsatisfactory</td>
<td>Emerging</td>
<td>Basic</td>
<td>Proficient</td>
<td>Distinguished</td>
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<td>DPAS II Planning and Preparation</td>
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<td>Connections to learning theory are unclear and not connected to learning goals.</td>
<td>Subtle connections are made with student learning profiles.</td>
<td>evident and appropriate.</td>
<td>toward achieving the learning goals.</td>
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<td>Planning provides a comprehensive profile of student learning for the whole class, subgroups, different learning styles, and connects learning goals across the curriculum and larger community.</td>
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<td>ACEI 3.2 Adaptation to diverse students —</td>
<td>Chosen Strategies do not address differences in learning styles, rates of learning and abilities.</td>
<td>Strategies provided limited attention to differences in learning styles and rates of learning.</td>
<td>An attempt is made to address student diversity when creating instructional opportunities.</td>
<td>Used strategies that provided for differences in learning styles, rates of learning and abilities.</td>
<td>Candidate provides specific implications for instruction and assessment based on student individual differences and community, school, and classroom characteristics that may affect learning in a diverse classroom.</td>
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<td>Subtle connections are made to adapt learning for diverse students.</td>
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<td>Opportunities are provided for guided and independent learning.</td>
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<td>Planning indicates a thorough understanding of child development and approaches to learning.</td>
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<td>ACEI 3.3 Development of critical thinking and problem solving —</td>
<td>No procedures are evident to promote critical thinking and problem solving.</td>
<td>Procedures provide vague information on the active engagement and implementation of instruction that encourages critical thinking and problem solving.</td>
<td>An attempt is made to use a variety of methods to promote critical thinking.</td>
<td>Skillful use of planning for instruction to promote critical thinking and problem solving.</td>
<td>Procedures provide information on the preparation, implementation, and active integration of instruction to encourage students' development of critical thinking and problem solving.</td>
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<td>A variety of teaching strategies makes a clear contribution to learning.</td>
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<td>Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning.</td>
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<td>ACEI 3.4 Active engagement in learning —</td>
<td>No procedures are evident to promote the active engagement of individual and social learning.</td>
<td>Strategies provided limited motivation to foster group and individual learning.</td>
<td>Instructional decisions are mostly appropriate for individual and group learning, but some decisions are not pedagogically sound.</td>
<td>Active engagement to promote individual and group learning is evident.</td>
<td>Activities and assignments are productive and appropriate for each student.</td>
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<td>The candidate plans activities to promote a safe, engaging and positive learning environment for both individual and group learning.</td>
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<td>ISTE 5c Designer</td>
<td>Unsatisfactory</td>
<td>Emerging</td>
<td>Basic</td>
<td>Proficient</td>
<td>Distinguished</td>
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<td>Supportive learning environments.</td>
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<td>Activities are fully aligned with learning goals and provide learning for the whole class, and individual students.</td>
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<td>Apply instructional design principles to create innovative digital learning environments that engage and support learning.</td>
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**ACEI 3.5 Communication to foster collaboration** —
Candidates use their knowledge and understanding of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the elementary classroom.

| No evidence of communication techniques to facilitate active inquiry or collaboration. | Communication strategies provided limited motivation to foster active inquiry. | Lessons appropriately incorporate effective communication techniques; however, student engagement and active inquiry is not evident. | Uses appropriate and relevant communication strategies to develop and foster collaboration. | Detailed information is included on how students are to go about completing the lesson. Varied communication techniques both verbal and non-verbal are articulated in the lesson to foster collaboration and social learning. Communication Materials and/or media enhance the lesson and are appropriate for objectives, activities and diverse learners. |

**ACEI 4.0 Assessment for instruction** —
Candidates know, understand, and use formal and informal assessment strategies to plan, evaluate and strengthen instruction that will promote continuous intellectual, social, emotional, and physical development of each elementary student.

| No clear assessment design is evident. | Assessment plan provides vague information on the strategies to evaluate and strengthen instruction to promote learning. | Some of the learning goals are assessed through the assessment plan, but many are not congruent with learning goals in content and cognitive complexity. | Assessments are appropriate to meet the individual needs of most students. Assessments are linked with most learning goals. | Each of the learning goals is assessed through the assessment plan; assessments are explicitly linked with the learning goals in content and cognitive complexity. The assessment plan includes multiple assessment modes and assesses student on-going and summative performance throughout the instructional sequence promoting intellectual, social, emotional, and physical development of each student. Uses student data to plan instruction and assessments. Use technology to design and implement a variety of formative and summative assessments that accommodate learner needs, provide timely feedback to students and inform instruction. |