EDU311-01 ~ Teaching Science in Schools

Credits: 4

Instructor: René A. Picó, Ph. D.
Office: 302 Old Main
Phone: 724.946.7283
e-mail: picora@westminster.edu
Office Hours: MWF 9:15-10:15 am, M 2:00-3:00 pm, and TR 10:00-11:00 am
Other times by appointment.

Course Description:
This course offers an introduction to the content and methods of science in the PK-8 schools. Careful attention is given to the organization and conduct of meaningful science learning experiences at the various age levels. The roles of inquiry and discovery teaching, hands-on learning activities, and current research are studied as they relate to the children’s acquisition of science concepts. Special attention is given to the treatment of values in science. Prerequisites: life science and physical science or permission of instructor. For early childhood PK-4/Special Education PK-8 majors.

General Objectives:
The pre-service teachers will develop and demonstrate a skillful understanding of the:
• Philosophical and historical foundation for science instruction in the United States.
• Emerging trends in the field of early childhood science education.
• Pennsylvania Department of Education, the Next Generation Science Standards (NGSS) and guidelines to develop innovative, active learning environments for Pre-K children.
• Instructional methodologies used for the teaching of science: earth and space, physical and life sciences.
• Assessment and evaluation processes of science learning at the PK-8 levels.

Course Texts:
*Required:

*Free PDF Download from the National Science Academies – National Academy Press with registration. Step by step instructions at the end of this document.
**Free Access to the science academic standards, assessments and teaching resources from the Pennsylvania Department of Education.
Westminster College Mission Statement
The mission of Westminster College is to help men and women develop competencies, commitments, and characteristics which have distinguished human beings at their best. The liberal arts tradition is the foundation of the curriculum continually designed to serve this mission in a rapidly changing world. The College sees the well-educated person as one whose skills are complemented by ever-developing values and ideals identified in the Judeo-Christian tradition. Westminster’s quest for excellence is a recognition that stewardship of life mandates the maximum possible development of each person’s capabilities.

OUTCOMES:
to reason logically and evaluate critically to communicate effectively
to think creatively, and appreciate aesthetic expressions to demonstrate intellectual curiosity
to acquire knowledge of self, society, human cultures, the natural world, and human relationships
to God to apply knowledge to contemporary issues to demonstrate moral and ethical commitments
to neighbor, society, and the natural world to demonstrate commitment to lifelong learning and the acquisition of skills for careers and responsible service as world citizens.

School of Education Mission Statement
The mission of the School of Education at Westminster College is to prepare PreK-4 early childhood/PreK-8 special education and secondary teachers who are distinguished by their subject matter knowledge, interpersonal capacities, pedagogical skills, and professional attitudes.

The School of Education seeks to create a community of learners in which stimulating and challenging expectations are addressed in a positive, caring, and encouraging environment which is respectful of all individuals. The faculty seeks to model the personal attributes and pedagogical practices which distinguish the teaching profession at its best.

Through study in the Westminster Plan, the Intellectual Perspectives, general coursework, and professional education, students are encouraged to build a professional knowledge base. Meaningful classroom experiences, multiple opportunities for children and youth, and partnerships with schools and agencies enable students to make connections between academic work and the field of basic education at all levels. Competencies are sought in content knowledge, understanding the diversity of all learners, instructional strategies, management, communication, planning, assessment, professionalism, and collaboration.

The nobility and significance of the preparation of professional educators are acknowledged as the demands for service to an ever-changing, diverse global and technological world increases.

Academic Integrity
Central to the purpose and pursuit of any academic community is academic integrity. All members of the Westminster community, including students, faculty, staff, and administrators, are expected to maintain the highest standards of honesty and integrity, in keeping with the philosophy and mission of the College. Academic dishonesty is a profound violation of this code of behavior. Outlined in the Graduate Catalog are examples of and specific consequences for academic dishonesty at Westminster. The list of examples is not meant to be exhaustive, but rather to provide an overview of the community’s common concerns. Students who are unsure as to whether specific behavior not listed here will constitute academic dishonesty should consult with their individual course instructors.
Evaluation Criteria:

<table>
<thead>
<tr>
<th>Task</th>
<th>Points</th>
<th>% of Grade</th>
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<tbody>
<tr>
<td>*Readings and Quizzes</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>**Tasks and STEM Challenges</td>
<td>150</td>
<td>30</td>
</tr>
<tr>
<td>Technology Tasks</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>Project STE(A)M</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>+Attendance, Participation &amp; Work Ethics</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>**Total</td>
<td>400</td>
<td>100</td>
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</table>

*/*/Unit Content Readings are assessed by [1] the participation in unit discussions (in class or online); [3] in-class and online quizzes; and [2] the integration of unit content into course tasks.

*/*/You must have active Westminster College digital accounts and access to e-mail, D2L and related tools to fulfill course requirements. You are responsible for gathering the required skills to succeed in a digital environment. Please seek training on the use of D2L, e-mail or technological tools necessary for this course.

*/*/As a student enrolled in this methods course, you should be prepared to use the following **basic technological requirements for a successful experience**: internet access, video/text conferencing capabilities, web-cam or video camera, video production and editing application, MSOffice Suite or analogous software for preparing documents, presentations, and graphics requested by instructional applications and unit assessments, and others.

*/*/Unit tasks, quizzes, and other class projects are to be submitted on the due date. Tardy work will lose 10% of the grade per day late; they will not be accepted after the fourth (4th) day. Some assignments will be submitted via the D2L system for which NO hard copies will be accepted. There will be no substitution for any missed assignment or activity. No exceptions. If you are absent from class, you are responsible for acquiring information on due assignments for the next session. Guidelines and evaluation criteria for assignments and class projects will be provided prior to and/or the day of the announcement.

+ Attendance at every class - coming to class on time and staying until class ends - is **expected and required**. Coming to class late or leaving early will be considered as a one-half unexcused absence. You may need to be absent from class on rare occasions or for serious reasons. Acceptable excuses for an absence are [1] medical, personal or family emergencies and require a signed note from a family member, corresponding representative or licensed professional - self-reported WC Health Center excuses will not be considered a valid excuse, or [2] professional or educational engagements supported by evidentiary records. Please, notify Picó in writing ahead of time, or call and leave a message in the case of an emergency. Ten (10) points will be deducted from your Class Attendance points for each unexcused absence. Students with more than three (3) absences may not receive credit for the course. Your inability to live up to attendance expectations will be considered as cause for a failing grade.

+ Participation in class and online activities via D2L will be monitored as part of the Participation evaluation criteria.

+ Work Ethics. It is of extreme importance to provide original work, professionally written statements, and properly cited work of other literary and digital authorities or sources. Some written tasks will be turned in via the Turnitin System. Plagiarism and unprofessional behaviors in our face-to-face or digital learning environments will not be tolerated and may be considered as a cause for a report to university officials.

+ Westminster College promotes mutual respect, tolerance for individual differences, and collaboration among colleagues. Professional attitude and participation are expected and required. If you are antagonized, provoked or threatened by the behaviors of a classmate during class or group work assignments, please notify Picó as soon as possible. Unprofessional behaviors will not be tolerated.

+ **BYOD.** The use of wireless computers and tablets is allowed during the class period to view, download, and read materials from and for the course. You will be asked to turn your technology off if caught involved using it for personal business or communication during class. You will be expected to bring your technology during BYOD (Bring Your Own Device) sessions.

+ The use of mobile phones is strictly prohibited during class unless authorized by the instructor. Phone activity causes unnecessary distractions and interruptions to you and your colleagues. Additionally, it is disrespectful to your instructor and peers. You will be asked to surrender your mobile device if caught misusing it during class. If you would not surrender your device, you will be asked to leave class. Please, notify the instructor at the beginning of the session if you need to maintain your device active for a special reason such as a family emergency, notification or call.
**Grading Scale:**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Range</th>
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<tbody>
<tr>
<td>A</td>
<td>94-100 %</td>
</tr>
<tr>
<td>A-</td>
<td>90-93 %</td>
</tr>
<tr>
<td>B+</td>
<td>87-89 %</td>
</tr>
<tr>
<td>B</td>
<td>84-86 %</td>
</tr>
<tr>
<td>B-</td>
<td>80-83 %</td>
</tr>
<tr>
<td>C+</td>
<td>77-79 %</td>
</tr>
<tr>
<td>C</td>
<td>74-76 %</td>
</tr>
<tr>
<td>C-</td>
<td>70-73 %</td>
</tr>
<tr>
<td>D+</td>
<td>67-69 %</td>
</tr>
<tr>
<td>D</td>
<td>64-66 %</td>
</tr>
<tr>
<td>D-</td>
<td>60-63 %</td>
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<tr>
<td>F</td>
<td>≤ 59 %</td>
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**TALK TO THE PROFESSOR IF A PROBLEM ARISES OR YOU NEED HELP!!!**

**Westminster College Resources**

**Academic Support**

The Learning Center is open for students who need assistance to improve their academic performance. The Center and its staff are in the newly renovated Thompson and will assist the faculty by developing skills within Clark building. The staff also their students that enable them to succeed in their specific disciplines. The Teaching Assistants, many of whom are among Westminster’s exceptional students, are prepared to help students identify strengths and weaknesses in reading and writing skills, strategies for improving these skills, and specific assistance in almost any class offered. Please contact the Learning Center at (724) 946-6700 with any questions, comments, or special requests.

**L I S Help** Library and Information Services oversees technological services for the campus community. The department provides services and support for students, staff, and faculty in their use of information resources. If you require technical support, you can contact LIS Help by calling extension 6000 or (724) 946-6000.

Reporting online via the LIS Help Tech Trouble Report
Email: LIShelp@westminster.edu
Stopping by the LIS Help Desk on the first floor of McGill Library
LIS Help Desk Hours Academic Year (Aug.31 - May 12)
(special hours may apply during holidays)
Monday Thursday:  7:30 AM - 1:00 AM
Friday:  7:30 AM - 9:00 PM
Saturday:  9:00 AM - 5:00 PM
Sunday:  1:00 PM - 1:00 AM

**Students with Disabilities Statement**

Westminster College makes every effort to provide reasonable accommodations for students with disabilities. This includes individuals with physical disabilities, learning disabilities and mental health disorders who meet the definition of disability under the Americans with Disabilities Act. Students with disabilities have the same responsibility as other students to meet the University's academic, technical, and behavioral standards and to follow the University's general policies and guidelines regarding standards of conduct. Students who plan to request accommodations should contact the Disabilities Resource Center at the beginning of each semester and provide the instructor with a letter outlining your specific academic needs. To determine whether you qualify for accommodations, or if you have questions about services and procedures for students with disabilities contact:

*Faith Craig*
*Disabilities Resource Center*
*Phone: 724.946.7192*
<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPICS</th>
<th>Assigned Resources and Readings</th>
<th>In-Class Activities</th>
</tr>
</thead>
</table>
| WEEK 1    | GEAR UP!                                                              | Welcome to EDU311 EDU311 Syllabus (PDF) Understanding the Course Format STEM Ecosystems How to Get Your School Ready for STEM Download required texts (PDF) | ✓ Science Facts Game  
✓ The Scientific Enterprise: Questions for Pre-service Teachers  
✓ UI A1 - Do We Need another Sputnik Moment? |
| AUG 28 & 30 | □ Introduction to EDU311 Teaching Science in the Schools  
□ Navigating the Course and Utilizing Its Resources  
□ Getting to Know Each Other  
□ Q&A for Pre-Service Science Educators  
UNIT I: History and Goals of Science Ed in the US  
□ Historical Perspectives of Science Education in the United States |                                                                                              |                                                                                      |
| WEEK 2    | UNIT I: History and Goals of Science Ed in the US                     | D2L Posted Documents Taking Science to School  
Ready, Set, Science!  
[A] Ch 1. A New Vision of Science in Education; pg. 1-16.  
[B] Ch 2. Four Strands of Science Learning; pg. 17-36. | ✓ UI A2 -- Why Teach Science?  
✓ UI A3 – NGSS & PDESAS Practice Run                                                                 |
| SEP 04 & 06 | □ Goals for Science Education  
□ Intro to The Science Standards: NGSS & PDE  
□ Developing a Sound Learning Culture for STE(A)M  
● Classroom Organization and Teaching Resources: Technologies, Supporting Literature, Textbooks & Science Education Materials/Kits  
● Cultural Values and Norms  
● Motivation, Attitudes and Identity |                                                                                              |                                                                                      |
| WEEK 3    | UNIT II: Science ED Curriculum and Systems                            | D2L Posted Documents Developing Assessments for the NGSS. Taking Science to School  
[B] Ch 9: Teaching Science as Practice; pg. 251-287.  
Ready, Set, Science!  
✓ Ull A2 – Writing Assessment Statements for Lessons                                                                 |
| SEP 11 & 13 | □ Science Education: Core Concepts and Progressions  
□ Planning and Managing Science Activities for Children: Unit and Lesson Planning  
□ Learning Intentions and Strategies for Success  
□ Assessment of Learning: Performance-based and Alternative Assessments for Young Children  
□ STEM Challenge #1  
□ PROJECT STE(A)M DESIGNS – Guidelines |                                                                                              |                                                                                      |
| WEEK 6  <br>OCT 02 & 04 | UNIT VI: The Life and Environmental Sciences  <br>*Jennings Environmental Education Growing Up Wild Curriculum Training*  <br>Environmental and Ecological Sciences: Watersheds, Wetlands, Renewable/Non-renewable Resources  <br>Agriculture and Society, Threatened, Endangered and Extinct Species; Humans and the Environment | D2L Posted Documents  <br>*Environmental Sciences Activities for the Growing Up WILD Curriculum  <br>Growing Up Wild Curriculum Certificate  <br>* You must attend both sessions to obtain a certificate | ✓ |
| WEEK 8  
OCT 16 & 18 | UNIT V: How Humans Produce Knowledge  
Discrepant Event Teacher Demonstrations  
The Art of Asking Questions and Managing Topic Discussions  
| D2L Posted Documents  
*Taking Science to School*  
Ch 5. Generating and Evaluating Scientific Evidence and Explanations; *pg. 129-166.*  
*Ready, Set, Science!*  
| ✓ UV A1: Question Asking Survey  
✓ UV A7: Question Asking Practice  
| WEEK 9  
OCT 23 & 25 | UNIT VII: The Life and Environmental Sciences PI  
The Life Sciences: Characteristics of Life, Function of Organisms, Classification, Adaptations, Evolution  
The Life Sciences: Life Cycles, Reproduction, Heredity  
Food Chains, Food Webs, Ecosystems  
Essentials of Plants and Animals  
Focusing and Discovery Activities & Demonstrations  
Tech Tasks: Mobile Microscopes  
| D2L Posted Documents  
*A Framework for K-12 Sci Ed*  
Ch 7. Dimension 3: Disciplinary Core Ideas – Life Sciences; *pg. 139-168.*  
| ✓ UVII A1: The Cell - SPS Constructing Models  
✓ UVII A2: Plant Anatomy  
✓ UVII A3: Bugs Up Close  
| WEEK 10  
OCT 30*  
& NOV 01 | UNIT VIII: The Space Sciences  
The Space Sciences: Universe, Galaxies, Stars, Constellations, Solar System  
Focusing and Discovery Activities & Demonstrations  
Tech Tasks: Google Sky  
*No Class - Fall Break*  
| D2L Posted Documents  
*A Framework for K-12 Sci Ed*  
Ch 7. Dimension 3: Disciplinary Core Ideas – Earth and Space Sciences; *pg. 169-200.*  
| ✓ UVIII A1: Constellations  
✓ UVIII A2: Solar System Tasks  
✓ UVIII A3: STARS: Defining Operationally  
| WEEK 11  
NOV 06 & 08 | PROJECT STE(A)M DESIGNS  
Synthesis and Revision of Products  
| D2L Posted Documents  
| ✓ Revision of PSD Products  
| WEEK 12  
NOV 13 & 15 | UNIT IX: The Earth Sciences  
Focusing and Discovery Activities & Demonstrations  
Tech Tasks: Gigapan and Earthquake Monitoring Apps  
| D2L Posted Documents  
| ✓ UVIX A1: Rain in a Bottle  
✓ UVIX A2: Travel to the Center of the Earth  
✓ UVIX A3: Let’s Rock! Tasks  
✓ UVIX A4: It’s a Rock Band – SPS Classifying  
| WEEK 13  
NOV 20 & 22* | UNIT X: The Physical Sciences PI  
Focusing and Discovery Activities & Demonstrations  
Tech Tasks: Solar Robots  
*No Class - Thanksgiving Break*  
| D2L Posted Documents  
*A Framework for K-12 Sci Ed*  
Ch 7. Dimension 3: Disciplinary Core Ideas – Physical Sciences; *pg. 103-138.*  
| ✓ UX A1: It’s a matter of Change  
✓ UX A2: Push and Pull  
<p>|</p>
<table>
<thead>
<tr>
<th>WEEK 14 NOV 27 &amp; 29</th>
<th>UNIT X: The Physical Sciences PII</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ The Physical Sciences: Electricity, Light, Colors, Magnetism, Sound</td>
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<tr>
<td>☐ Focusing and Discovery Activities &amp; Demonstrations</td>
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<tr>
<td>D2L Posted Documents</td>
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<tr>
<th>WEEK 15 DEC 04 &amp; 06</th>
<th>PROJECT STE(A)M DESIGNS</th>
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<tr>
<td>Synthesizing Outcomes</td>
<td></td>
</tr>
<tr>
<td>D2L Posted Documents</td>
<td></td>
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</tbody>
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| ✔️ UXI A3: Short Circuit |
| ✔️ UXI A4: It’s attractive! |
| ✔️ UXI A5: Colors of Light |

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<thead>
<tr>
<th>FINALS WEEK DEC 10</th>
<th>Final Session: Monday, December 10 @ 3:00-5:30 pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Presentation of PROJECT STE(A)M DESIGNS</td>
<td></td>
</tr>
<tr>
<td>✔️ Upload of PSD Products to D2L</td>
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Dr. Picó reserves the right to change the schedule and evaluation criteria if/as the need arises. Some course activities will be performed in class while others will be assigned for completion outside the class period. Due dates will be offered in the guidelines. The class will be notified of changes before they take effect.

The topics are many, and the outline seems a bit hefty, so be careful not to fall behind.

**CONTACT THE INSTRUCTOR IF A PROBLEM ARISES OR YOU NEED HELP!**

*Dr. Picó will answer messages or requests from Monday to Friday within a 24- to 48-hour period. Messages or requests received during the weekend will be answered on the next workday.*
Accessing the National Academies Press Resources
To gain access to the resources offered by the National Academies of Science:

1. Visit the National Academies Press on-line at http://www.nap.edu/

2. Register and create an account. The register button is located in the upper right corner of the page.

A sign-up window will appear titled: “Sign Up for MyNAP.” Complete and submit. The registration process requires an e-mail address and a password.

NOTE: Write or save your login information in a secure location for future access; for example: on the hard copy of the EDU311 Syllabus, the class notebook, the smartphone note/list application or other.

3. Once you are registered and logged in, go to the search box and type the title of the book you would like to acquire.
4. Select the desired book from search list – check author and/or publishing year. Download your textbook as a PDF file by clicking the “Download” hyperlinked PDF button.

5. During the downloading process, a pop-up window will appear requesting a comment about the intended use of the document. You may opt to click on “No thanks” or to provide an explanation for your download.

As an educator, you may provide one or more of the following rationale: professional development, professional enrichment, research, continuing education, or other acceptable aim deemed of a professional educator.

6. Save to your computer or external memory device. It is recommended that you rename the file as it is already titled with a numeric filename, not the true book title. You may rename the file with the actual title of the textbook being downloaded for consistent identification.

7. Repeat steps 1-6 for downloading additional book files. Logout from your account when you are finished.