

Lift-Off For Teachers and Youths (LOFTY) Program
A grant through the Wisconsin Space Grant Consortium (WSGC)

Course Title: "Interdisciplinary 501: Workshop for Pre-College Teachers
1 Graduate Credit

Instructors:

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Course Description:

The Lift-Off For Teachers and Youths (LOFTY) program brings together the UW Oshkosh Science Outreach Program within the College of Letters and Science and College of Education and Human Services faculty to provide a space-related science learning opportunity for in-service teachers that in turn excites and engages the students they teach in aerospace-related science, design and technology. This project dovetails nicely with many of the other hands-on science programs already conducted by Science Outreach, while at the same time filling a void of increasing the content knowledge of elementary teachers, and increasing the interest and hands-on space-related science experiences for elementary students in Wisconsin. The LOFTY project also emphasizes current NASA education goals including helping educators and students develop the critical skills and knowledge base in space-related science. By bringing in elements of an in-service hands-on teacher training, cross disciplinary discussions to incorporate a rocket unit into each subject, planetarium shows at the Buckstaff Planetarium, and using the framework of the Science Olympiad rules and values, we hope to increase interest in and the love for science, technology, engineering and mathematics (STEM).

Course Goals/Objectives:

- Learn and discuss the scientific and mathematic fundamentals of rocket design and technology.
- Design and build a bottle (water) rocket in order to experience first-hand all the elements that factor into creating a successful rocket.
- Integrate space-related science curriculum into the classroom.
- Help students learn the principles of rocket engineering, employ the scientific method to design and construct a bottle rocket, refine their design based on test launches, and launch their rocket in a school or district wide competition.
- Bring science, specifically aeronautics, to life for elementary educators and students.
- Make science education exciting to encourage more students to engage in science classes, science activities, and STEM (science, technology, engineer, and mathematics) careers.
- Use student teamwork to ensure students learn and teach each other, work together to solve problems, and help each other understand science concepts.
- Encourage elementary students to continue exploration of science in a team setting by participating on a middle school Science Olympiad team.

Course Requirements:

1. Attend the two Saturday meetings of the course (Saturday, September 24th and Saturday, October 8th, 2011).
2. During the workshop, design and build a bottle (water) rocket in order to experience first-hand all the elements that factor into creating a successful rocket.
3. Assess student learning and the efficacy of the unit using pre- and post-tests provided (or normal classroom evaluation tools).
 - a. There is a template available on the LOFTY workshop website. You can download these template questions and adapt/customize for your class.
4. Assess student interest in STEM careers (using the survey instrument provided).
 - a. Template available on the LOFTY workshop website.
5. Create a lesson plan for one subject outside of science that incorporates space-related science.
 - a. No template for this, unless requested. We prefer to allow you to create a lesson plan in a format that works for you, your class, your school, and your students.
6. Write a short (2-4 page) analysis paper on the integration of space-related science curriculum into your classroom (cross discipline teaching).
 - a. Description available below and on the LOFTY workshop website.

Course Grading:

Attendance is required at each Saturday meeting of the course. Unexcused absences will result in a drop in letter grade.

Course grades will be computed by the following:

Item	Percentage of Grade	Due Date
Attendance and participation	15%	Due each day of workshop
Design and build a bottle (water) rocket	15%	Launch on Oct 8 th
Lesson plan for one subject (incorporate science curriculum)	20%	Due Oct 8 th
Assess student learning (pre/post test)	15%	Due May 1, 2012
Assess student interest in STEM careers (template survey)	15%	Due May 1, 2012
Analysis Paper	20%	Due May 1, 2012

Letter grades will be given as follows:

Grading for Graduate Level Course			
Grade	Percentage Points	Grade	Percentage Points
A	95.5 - 100	C+	80.5 - 82.4
A-	92.5 - 95.4	C	75.5 - 80.4
B+	90.5 - 92.4	C-	72.5 - 75.4
B	85.5 - 90.4	F	< 72.4
B-	82.5 - 85.4		

Analysis Paper Outline

Your analysis paper should focus on synthesizing what you learned through this workshop, how you integrated the rocket curriculum into your classroom, what your students learned through this curriculum, and the impact of this curriculum on your students.

The report should follow the below:

1. Introduction (2-3 paragraphs): Provide relevant information about space-related science, and introduce the topic of how this curriculum was incorporated into your classroom (i.e. what you did through this workshop).
2. Methods (no more than 1 page): Describe what you did to integrate space-related science curriculum into your classroom:
 - What activities did you select? Why?
 - How did you teach these activities/lessons? In what order? Why?
 - How did you connect space-related science to other disciplines? Why?
3. Data (no more than 1 page): This section will include data collected during implementing this curriculum in your classroom – both quantitative assessments (pre/post test evaluations, attitudes survey) and qualitative data.

- Quantitative data collected from a pre/post test of student knowledge. An example table is presented below. Raw scores are preferred over percentages.

Student ID	Score on Pre Test	Score on Post Test	Percent Change
1	4/10	8/10	$(8-4/4) * 100 = 100\%$
2	5/10	9.5/10	$(9.5-5/5) * 100 = 90\%$

- Quantitative data collected from the student attitudes survey (provided on LOFTY website). This survey will assess if students' attitudes towards science change as a result of hands-on, minds-on science curriculum that is cross disciplined.
 - Qualitative data collected from 3 areas:
 - A. Your observations of students and the lessons (i.e. what worked, what didn't, what did students like, what didn't students like, what can be changed, etc). This is from your perspective – not student perspective.
 - B. Open ended questions on pre/post test. You can modify the pre/post test provided on the LOFTY website to include open-ended questions to get at a higher level of understanding or assessment of student learning.
 - C. Information from "focus groups" – by talking to groups of students about what they liked and did not like, what recommendations do they have for making this a better experience, do they like science, do they want to learn more, etc.
4. Conclusion (2-4 paragraphs): Should provide an overall discussion and interpretation of the information presented throughout the paper – your personal synthesis of the data (explanation of the quantitative and qualitative data, what you would do differently next time, what would you keep the same, what other disciplines can you incorporate, what other implementation connections can you make?).
 5. References
 - At least 5 references will be cited throughout your paper (parenthetically by number).
 - No more than 75% of the references can be web references/citations.

LOFTY Workshop Schedule – Day 1

Principles of Rockets		Saturday, September 24, 2011
8:00 – 8:20	Welcome, Introductions, Course Overview	
8:20 – 8:40	Pre-course Survey	
Rocket History		
8:40 – 9:10	Using Notebooks in the Classroom	
9:10 – 9:30	History of Rockets	
9:30 – 9:45	Flame Tests	
Rocket Principles		
9:45 – 10:15	Propulsion	Film Canister Rockets
10:15 -11:00	Propulsion	Rocket Science
11:00 – 11:30	Aerodynamics	Heavy Lifting
11:30 – 12:00	Propulsion	Two-Stage Rockets
Working Lunch		
12:00 – 1:00	Planetarium: Mars Show	
More Rocket Principles		
1:00 – 2:00	Aerodynamics	Paper Rockets
Designing a Rocket		
2:00 – 2:30	Water Rocket Simulator	
2:45 – 3:00	Brainstorm Integration and Connections to the Classroom, Exit Slips	

LOFTY Workshop Schedule – Day 2

Day 2 : Launching Rockets in the Classroom		Saturday October 8, 2011
8:00 – 9:30	A Multi-disciplinary Approach to Rockets	
9:30 – 10:00	Rocket Stability: Center of Mass, Pressure, Swing Test	
Rocket Building		
10:00 – 11:00	Project X-51	
11:00 – 12:00	Water Rockets	
Working Lunch		
12:00 – 1:00	Putting it all Together	
Launch!		
1:00 – 1:30	Altitude Tracking	
1:30 – 2:30	Water Rocket Competition	
2:30 – 3:00	Post-course Survey	