

STEM Outreach Virtual Program



ACTIVITIES MENU - FALL 2020

Embry-Riddle Aeronautical University
Prescott Campus
STEM Outreach Office

Introduction

Foreseeing restrictions to campus field trips and gatherings in the Fall semester, we here at Embry-Riddle STEM Outreach wish to continue our efforts to engage with our K-12 community virtually. In the past, K-12 educational schools and organizations have explored Embry-Riddle's offerings of STEM education while extending their knowledge of concepts taught in the classroom. Using virtual learning techniques, STEM Outreach will continue to offer these exciting opportunities for students to learn and engage with us from their homes or classrooms. The following document contains a menu of programs and activities available under this program.

Virtual Outreach Session Structure

Sessions will be conducted live by STEM Outreach staff members with assistance in facilitation from educator(s) present. Sessions will utilize the platform Zoom for content delivery.

Technology Requirement

Individual student computers OR a class computer and projector are required for all sessions. Microphones are encouraged but not required, as two-way voice capabilities will increase the quality of interaction.

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Please Note: This is a working document. Updates will be made as circumstances change.

Updated: June 28, 2020

STEM Discovery Visit

Recommended For: All Grades

This experience takes the former STEM Outreach field trip and transforms it into an engaging virtual opportunity for discovering how Embry-Riddle teaches and promotes STEM education. This introductory single-session experience is customizable to various time constraints, focuses, and ages. The following activities are available for a STEM Discovery Visit.

Activities Menu

- Live Planetarium Presentation + Q&A – 40 to 50 mins
- Tour of STEM Education Center – 20 mins
- Tour of Campus Facilities (Including STEM) – 45 mins
- Tour/Observation of Laboratory – 30 mins
 - Subject to lab/faculty availability
- Q&A with ERAU Student(s) – Variable
- STEM Educational Activity *
 - Requires purchase of materials by teacher/educator
 - If unable, demo only option is available

*STEM Educational Activities

- Slingshot Plane
 - *Materials:* Styrofoam plate or cardstock, bendable straw, rubber band, large paper clip, scotch tape
 - *Description:* Assemble a slingshot dart and test how launch force (thrust) affects distance traveled
- Aviation Telephone
 - *Materials:* 2 paper cups, 2-3 yards of string, 2 paper clips, pin or scissors
 - *Description:* Assemble a soup can telephone and attempt to effectively communicate air traffic control (ATC) instructions to a partner
- Engineering 101
 - *Materials:* Spaghetti noodles & mini marshmallows OR 10 sheets of paper & textbooks/other weight

- *Description:* Engineer the tallest free-standing tower OR create a paper structure that can support the most weight using basic concepts of engineering “sound structures”
- Straw Rockets
 - *Materials:* Bendable straw, paper, scotch tape, scissors
 - *Description:* Create a mini rocket and complete challenges such as highest flight, steady direction of travel, etc.
- War Games
 - *Materials:* Paper & pencil for note taking
 - *Description:* Master the concepts of communication, teamwork, and critical thinking through a simulated real-world scenario involving a crisis, domestic/international conflict, etc.
- It's CODE HOUR
 - *Materials:* Paper & pencil
 - *Description:* Investigate the concepts of encryption and coded messages by interpreting and creating your own messages
- Solar System Scale Model
 - *Materials:* Spaghetti noodles, mini marshmallows, ruler
 - *Description:* Investigate the concepts of distance in our solar system by assembling a to-scale model of our planets
- Moon Rover Challenge
 - *Materials:* Fabric for blindfold, rocks/shells/other materials for samples
 - *Description:* Master the concepts of lunar rovers and their abilities by having a blindfolded student serve as a rover and a team of mission controllers guiding them to various samples

ERAU in a Nutshell

Recommended For: Grades 2-8

This experience encompasses a larger scale, comprehensive, hands on mini course for students taught by ERAU STEM Outreach staff. Course material is covered over the span of several sessions with each session introducing a new subject relevant to the overall topic. There are four different “course offerings” that correspond to the different colleges within ERAU available for educators to choose from.

Scheduling Options

- Option 1: One session a week until completion
- Option 2: One session a month until completion
- Requests to deviate from scheduling options will be granted at STEM Outreach’s discretion, dependent on staff availability

Course Offerings

Engineering: Design a Lunar Lander

- Recommended for: Grades 6-8
- Learning Outcome(s)
 - Students will learn about the engineering design process and be able to experience hands-on activities going through this process. They will also build on teamwork, planning, and critical thinking skills throughout the course
- Course Description
 - Teams of four build a lunar lander using the engineering design process. Preliminary design in first session, building in second session (students are encouraged to bring in materials from home), testing (via egg drop) in the third session, evaluate and discuss what could be done differently in the future in the fourth session

Aviation: Aviation 101 (Basics of Flying)

- Recommended for: Grades 5-8
- Learning Outcome(s)
 - Students will learn about the science and engineering behind flight, and skills important for aspiring pilots

- Activity Description
 - Session one will cover how an aircraft flies (forces of flight) with a paper airplane activity, session two will cover aircraft parts (engine, flight controls) through the activity “pin the part on the airplane”, session three cover pilots (what they do, how they work together) through aviation and pilot Pictionary and discussion, and the fourth session will utilize concepts learned throughout the course to attempt a flight using a free online flight simulator (www.geo-fs.com – multiplayer disabled)

Security and Intelligence: War Games

- Recommended for: Grades 6-8
- Learning Outcome(s)
 - Students will practice critical thinking skills, problem solving skills in real world scenarios, and begin to develop an understanding of decision making on an international level
- Activity Description
 - Session one will cover what war games are and why we do them along with a practice game. Session two will be the first war game (earthquake in Taiwan, and China warns against sending aid). The actors are the President, the State Department, the US military, and the Red Cross. Session three will be the second war game which builds off the first game (US sends aid to Taiwan, what does this look like?). Actors are the President, State Department, US military, and Taiwanese government. The fourth session will be a more fictional scenario, where students are encouraged to use the skills they’ve learned from past sessions in a more abstract setting (astronauts en route to Mars are alerted by NASA that sudden signs of intelligent life have been found near the landing site on Mars. Students must determine what next steps are, serving as the actors: NASA, the astronauts, the President, and the Martians)

General Science: Solar System Basics

- Recommended for: Grades 2-5
- Learning Outcome(s)
 - Students will learn about what makes up our solar system, how we explore it, and learn about the basic science behind planets

- Activity Description
 - Session one will cover basic solar system facts and how we study the solar system (rover activity, www.nasa.gov/content/goddard/what-did-hubble-see-on-your-birthday, and worldwidetelescope.org). Session two will cover inner planet characteristics. Session three will cover outer planet characteristics. Both sessions two and three will focus on creating models of inner and outer planets using items found in the classroom and/or at home. Session four will be “create your own solar system”- knowing now what planets are made of and how the solar system works, students will work in small groups to come up with their own new planet. Planets will be combined to create a new solar system

Math Curriculum Support

Recommended for: Grades 2-8

This experience is designed to mimic a “real-world” experience to support a variety of in-class math curricula. The Math Curriculum Support option utilizes a real-world scenario with opportunities for both math concept reinforcement and exploring topics such as flight planning and space exploration. Each scenario is flexible enough to support math concepts from basic addition and subtraction to basic pre-algebra. Advance coordination with a STEM Outreach staff member will be necessary to tailor this experience to individual classrooms.

Scheduling Options:

- Single Session: One session w/ lower complexity scenario
- Recurring Sessions: Multiple sessions w/ multi-stage scenario

Structure*:

- Introduction: Mini presentation on “what” and “why” information in scenario topic taught by a STEM Outreach student
- Step 1 (Easy): Introductory level math problems with theme of preparing for start of mission scenario
- Step 2 (Intermediate): Problems contain slight complexity increase with theme of normal mission operations
- Step 3 (Challenge): Problems remain the same or slight complexity increase with theme of unexpected “challenge” to overcome for mission completion
- Debrief: Review discussion of concepts, reflections, and conclusion

*Notes

- Structure can be edited for time constraints with single session option
- All scenarios are customizable for individual classroom needs. Math concepts & complexity can be adjusted. STEM Outreach will consult with educators when producing these scenarios

Example Scenario:

- Background: You and two friends are off to Los Angeles, CA for a fun filled trip to Disneyland! It's not as fun to fly on an airline and since you have a pilot license, you've offered to fly everyone out instead! As a professional pilot, there are critical pieces of information you need to ensure a safe flight! Let's work through how you as a pilot will find this information and get your friends to Disneyland!
 - Math Concepts: Variables, Equations, Order of Operations
 - Aviation Concepts: Pilot Responsibilities, Flight Planning, Weight & Balance
- Steps:
 - Step 1: Using formulas such as $C.G. = \text{Moment}/\text{Weight}$; appropriately place passengers and baggage throughout airplane, determine if airplane is overweight, and calculate how much fuel may be carried
 - Step 2: Using formulas such as $\text{Speed} = \text{Distance}/\text{Time}$ and $\text{Fuel Req'd} = (\text{Distance}/\text{Speed}) \times \text{Fuel Burn}$; calculate critical performance specs such as distance, flight time, and fuel required
 - Step 3: A thunderstorm has developed over Los Angeles and you must divert! Without a calculator (you're flying!), determine how much time and fuel it will take to reach an alternate airport. When you arrive, will you need to refuel in Los Angeles?