STEM
Traveling Enrichment Program
&
Classroom Workshops

Jeremy Griffus
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Program Description

Xploration provides enrichments and workshops to all Adult Learning Center after school programs. This program is also available to schools during the school day across Southern NH. Xploration promotes fun enrichment that encourages students to design, create, and problem-solve using their critical thinking skills and team work. This unique program is led by an experienced STEM (Science, Technology, Engineering, and Math) instructor who engages students in learning that is hands-on, team-based, and grounded in scientific exploration. Watch students as they experience an “aha” moment that sparks interest and deep thought in a particular subject area.

Xploration offers developmentally appropriate activities with an emphasis on fun and interactive learning. All activities can be adapted to program and curriculum needs. Do you have an idea but don’t see it on our program list? Xploration may be able to work with you and customize a workshop that fits your needs.

How to Participate

We welcome and encourage schools to participate in this program during the school day. We invite you to view our website as our program continues to expand and update frequently. Find out more by visiting our website at www.nashuaalc.org and following the “children” tab to the Xploration page.

Contact: Jeremy Griffus
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603-882-9080 Ext. 2205
Things to keep in mind when planning your Xploration visit!

1. Most of the workshops include a presentation using a screen and projector. While we will provide both, please keep this in mind when choosing your space.

2. If scheduling multiple workshops, please plan on having students move to one set location. Equipment set-up takes time and we want your students to get the most out of the visit!

3. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time. The length of most workshops can be customized.
About the Instructor

Jeremy Griffus first joined the Adult Learning Center in 1998 as a student volunteer. His natural aptitude for working with children led to his hire and subsequent promotion to Summer Camp Site Director and again to Activities Coordinator for the Adventure Camp Program. For over a decade, Jeremy also worked during the day for the Hudson School District until leaving to develop and devote himself full-time to Xploration, the STEM Traveling Enrichment Program, an initiative of the Adult Learning Center.

Jeremy is passionate about teaching STEM enrichment courses to elementary and middle school students. His gift for encouraging young minds to explore all possibilities, using hands-on activities, shines through all of Jeremy’s workshops. Always on the cutting edge, Jeremy continues his own professional development by attending workshops and events throughout the United States to bring the most innovative experiences to his students. In 2018 Jeremy received his NASA Endeavor STEM teaching certificate for graduate-level work online through Columbia University. The NASA Endeavor curriculum further enhanced Jeremy’s ability to bring STEM workshops into the classroom and compliment the learning already taking place in all the school districts.
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Paper Air Rockets

Suggested Location:
A room with long tables such as a cafeteria or a classroom. A room for launching with high ceilings is preferred, however, the launcher can be adjusted for launching down a hallway. If the weather is cooperative, outdoors is a great launching location.

Suggested Amount of Time: 1 Hour per workshop.
Length can be customized.
If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
This engaging lesson will have students become engineers and design their own rocket made of paper and a foam nose cone. We start by having a discussion about rocket design and what they feel will make a good rocket. Do you want a pointy or flat cone? How big will your fins be? How many fins will you have? Construction begins as students choose materials and bring their creative ideas to life. Now it’s time to launch! Review and discussion wrap up the activity and, of course, students can take home their rocket.

Learning Outcomes:
Basic aeronautics, gravity, air resistance, air pressure, trajectory, forces and motion, acceleration, momentum.

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Water Rockets

Suggested Location:
Rocket construction should take place in a cafeteria or a room with tables to be used for workspace. Launching must take place outside.

Suggested Amount of Time: 2 days @ 1 hour each day.
Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
Day 1: Students will participate in a discussion with the instructor about what they think a rocket looks like. What are the fins? Why do rockets have fins? Why is the top pointy? What makes a rocket fly? Students then take those ideas and try to implement them as they construct their own personal rocket while working within an imaginary budget.
Day 2: Launch day! Students will decide how much water they would like to use in their rocket. They will also decide how much PSI they’d like to pump into their rocket before launching. Does more or less water increase the height? Does a higher PSI have an affect your rocket? With the instructor’s assistance, the rocket is attached to the launcher. Spectators and others waiting their turn stand at a safe distance and observe the results of each design while maybe getting a little splash here and there. The activity wraps with review and discussion.

Learning Outcomes:
Basic aeronautics, gravity, air resistance, air pressure, trajectory, forces and motion, acceleration, momentum.

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Additional fees may apply depending on the source of the 2L bottles.
Wind Tunnels

Suggested Location: A classroom or open area with tables for student workspace.

Suggested Amount of Time: 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description: This enrichment is an innovative approach to learning the effects of moving air on different objects. Students will be presented with a series of challenges using simple materials and testing the flight effects inside one of Xploration’s vertical wind tunnels. Can you create an object that will fly out of the tunnel? Can you invent a way for that object to stay hovering in the tunnel? Can you design an object that will spin or fly in an unusual way? Students will have the opportunity to share their designs and discuss the results of the test flights.

Learning Outcomes: Airflow, drag, symmetry, turbulence, air resistance and gravity.

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Wind Vortex

Suggested Location:
This workshop can be conducted in a classroom however it’s suggested that the students have room to spread out such as a cafeteria or gymnasium.

Suggested Amount of Time: 1 Hour per workshop.
Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
“What is a vortex?” Most will make a reference to a video game, black hole or a tornado which are all acceptable answers. What are the similarities? How can we harness this energy? Students create their own “Wind Vortex Generator” and test the vortex theory by attempting to knock down cups using their vortex generator. How far away can you stand and still knock down cups? What makes your vortex generator successful or not? The instructor then “super sizes” the vortex generator and demonstrates how powerful this source can be. To prove that a vortex is actually being created, the instructor adds fog. Students marvel as giant smoke rings travel across the room and knock down cups. Feel the power! After review and discussion, students can take home their mini vortex generator.

Learning Outcomes:
Fluid dynamics, air displacement, toroidal vortex, harnessing energy, power of wind.

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Allergy Warning: Latex balloons used for this lesson.
Shaping Watersheds

Suggested Location:
This workshop can be conducted in a classroom however it’s suggested that the students have room to spread out such as a cafeteria or gymnasium.

Suggested Amount of Time: 1 Hour per workshop.
Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
Why go to the museum for interactive exhibits, when the exhibits can come to your school? The Shaping Watersheds workshop brings a 3D interactive augmented reality sandbox and two additional 3D surface water pollution tables. The classroom is divided into three separate areas and students will take turns at each station. Students will see first hand how water flows from higher elevations to lower elevations, how water can pick up pollutants, how we effect the watersheds daily and how we all live in a watershed.

Learning Outcomes:
Basic hydrology, watersheds, topography, tributaries, water cycle, water conservation

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Balloon Hovercrafts

Suggested Location:
Introduction, demonstration and building should take place at desks or tables. A smooth tiled floor is needed for large hovercraft demonstration. Mini hovercraft testing can be done easily in the back of a classroom or hallway. Smooth floors are a must.

Suggested Amount of Time: 1 hour per workshop. Length can be customized.
If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
Students participate in a discussion with the instructor about hovercrafts. Have you ever seen one? How do you think it works? How are they beneficial to us? Next, the instructor provides a fun demonstration with a homemade hovercraft as students observe how air is pushed out from underneath to create the air cushion which causes the craft to “hover”. Students then apply those concepts while making their own hovercraft using a balloon, bottle cap and CD. Once the hovercrafts are built, students marvel as they race down the hall pushed by a fan! So simple but so much fun! The activity ends with review and discussion. Students can take home their mini balloon hovercraft.

Learning Outcomes:
Air pressure, friction, aerodynamics, forces and motion.

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Allergy Warning:
Latex balloons used for this lesson.
Helicopter Flight

Suggested Location:
This workshop can be run in a classroom, however it’s suggested to have an open space such a cafeteria or gymnasium.

Suggested Amount of Time: 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
We have all seen them flying through the air in real life and on television, but do we understand how they work? An initial discussion comparing flying vessels brings the group to wonder why a helicopter is different. Students then create paper helicopters to help demonstrate what they have discovered through our discussion. Once the helicopters are built, they will toss them in the air and watch them spin to the ground. Students experiment with different types of paper and adding weight to the bottom of the helicopter to determine how their vessel will react. Finally, expanding on their personal observations, students will receive a plastic propeller spinning toy to experiment with and observe how they fly. The room soon fills up with flying objects! What a blast! Review and discussion follow the fun and students can take home their paper and toy helicopters.

Learning Outcomes:
Basic aeronautics, gravity, air resistance, acceleration, momentum, forces and motion.

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**Super Structures**

**Suggested Location:**
A large open area such as a cafeteria, gymnasium, or empty classroom works best.

**Suggested Amount of Time:** 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

**Description:**
Small and large buildings can be quite impressive. These structures are designed and built to withstand heavy loads of snow, strong winds and other natural elements. Students participate in a group discussion: What do we know about building shapes? What do we usually find under a building, in the middle of a building and on top of a building? After reviewing the engineering process (Ask, Imagine, Plan, Create and Improve), students will break into groups and build a structure with specifications based on grade level and dynamic of the group. The final test? The building must be able to survive a pretend hurricane produced by a leaf blower! The workshop ends with review and discussion.

**Learning Outcomes:**
Center gravity, foundations, load bearing, structural support and integrity, intro to hurricanes.

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Farmer’s Bridge

Suggested Location:
A large open area such as a cafeteria, gymnasium, or empty classroom works best.

Suggested Amount of Time: 1 Hour per workshop.
Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
For this workshop students can work in small groups or individually. The engineering design process is reviewed (Ask, Imagine, Plan, Create, and Improve). A story is told describing a setting and problem for the young engineers to solve. Using only the designated materials, students must build a bridge over a “river”. The purpose of the bridge is to get farm equipment from the farm to the farm land on the other side of the river. The bridge must be strong enough to hold a toy tractor. The river is actively used by boaters, so the bridge must be high enough for boats to travel under it safely. A toy boat will be used to test this. Students will have an opportunity to test and improve their design before the final trial. This activity really gets the mind thinking and students share their thoughts in a review and discussion period to close out the workshop.

Learning Outcomes:
Bridge types, span, weight distribution.

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Crash Test

Suggested Location:
This workshop can easily be adapted to most locations. (Classroom, gymnasium, hallway, cafeteria, etc.) Not suggested for outdoors.

Suggested Amount of Time: 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description: What keeps you safe when you drive in a car? Following a short presentation, a discussion will take place about what keeps us safe in a vehicle. We will also discuss how safety has improved in vehicles over the years. These young engineers / scientists will follow the same steps that leading vehicle manufacturing professionals do. Students are divided into small groups to design and develop safety features for a model vehicle. When it’s time to test those features, a “crash test dummy” equipped with a sensor will be seated in their vehicle. It will be sent on a test drive down a ramp for a crash. We will then make observations and improvements following the engineering and design process. The objective is to design safety features that will prevent life threatening injuries from occurring to your “crash test dummy”.

Learning Outcomes: Acceleration, momentum, forces and motion, automobile safety.

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Super Coasters

Suggested Location: A large room such as a cafeteria or gymnasium.

Suggested Amount of Time: 1-1½ hours per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
Students become real engineers during this enrichment activity. Using foam tracking and marbles, they are challenged to make a ski jump, an upside down loop and ultimately a “super coaster”. Students soon learn different tricks to send their marble through this “super coaster”. After each challenge, we will discuss what works and what is not working. This sharing of ideas affords the students the opportunity to learn from each other.

Learning Outcomes:
Centrifugal force, gravity, velocity, trajectory, forces and motion.

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Bubble Adventures

Suggested Location:
A large open area such as a cafeteria, gymnasium, or empty classroom works best. Activity #3 must be done outdoors.

Suggested Amount of Time: 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
Bubbles are so simple. We have all played with them at some point in our lives. Have you ever thought about the science behind what makes a bubble possible? How does it work? Why are some bubbles different than others? Students will participate in three different activities which explore and test the science behind bubbles. #1: Using small bubble wands, how many actions can you observe from the “Bubble Challenge Chart”? #2: Using materials provided, make your own bubble wand and test it. How is your wand different from the others? #3 If an outdoor area is available, students will take turns using a “large bubble wand” to make giant bubbles. The workshop culminates in review and discussion. Students can take home their homemade bubble wand.

Learning Outcomes:
Elasticity, surface tension, basic chemistry.

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Boo Bubbles

Suggested Location:
A room with long tables such as a cafeteria or a classroom.

Suggested Amount of Time: 1 hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
This enrichment includes two experiments and two demonstrations involving dry ice. Students learn what dry ice is and how it is affected by rapid warming. While this process is happening in front of them, they’ll be “wowed” when they see the fog roll off the tables. In the first experiment, students will attempt to control the released carbon dioxide “fog” by capturing it in the form of bubbles. Can you catch a bubble in your hand? In the second experiment, students form a hypothesis. What will happen if we release the carbon dioxide in the bubble solution? Tons of fun! The workshop ends with review and discussion.

Learning Outcomes:
Understanding Carbon Dioxide, states of matter, surface tension, water vapor.

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Dry Ice Safety

- Safety rules will always be reviewed and enforced
- Only the instructor will handle dry ice
- Dry ice is non toxic
Elephant’s Toothpaste

Suggested Location:
A room with long tables such as a cafeteria or a classroom.

Suggested Amount of Time: 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
Students first discuss what they know about chemical reactions. We then examine what Hydrogen Peroxide is and compare it (H₂O₂) to water (H₂O). Now it is time to separate that extra oxygen molecule by adding a catalyst. The extra oxygen is captured in soap suds which has a fun reaction and oozes out of the bottle. Following their experiments, the instructor will take this experiment to the next level and demonstrate the same procedure but with more powerful materials. It’s quite a show!

Learning Outcomes:
Chemistry basics, H₂O vs. H₂O₂, decomposition using catalyst, exothermic reactions.

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**Slime Science**

**Suggested Location:**
A room with tables or desks such as a cafeteria or a classroom.

**Suggested Amount of Time:** 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

**Description:**
Ooey Gooey fun! Following a brief presentation, and a couple demonstrations, students begin making their own slime. Starting with a polymer, students will add different elements that could change the viscosity, color and texture of their slime. Is it liquid? Is it solid? Neither, it’s a non-newtonian fluid. Students test and experiment with their slime as we wrap up.

**Learning Outcomes:**
Chemistry basics, states of matter, cross linking molecules

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**Soda Geyser**

**Suggested Location:**
Outdoors on a grassy area. This can be done on pavement, however it’s suggested that you have a hose available for cleanup.

**Suggested Amount of Time:** 1 Hour per workshop.
Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

**Description:**
Get ready, get set, get messy! The days of mixing baking soda and vinegar are over once you try an eruption like this one. Rather than a chemical reaction, the students learn about and observe a physical reaction. Water molecules strongly attract each other, linking together to form a tight mesh around each bubble of carbon dioxide gas in the soda. When the students pull the string which releases several Mentos Mints into a 2 liter bottle, the crowd goes wild. This activity concludes with review and discussion of what was learned and observed.

**Learning Outcomes:**
Physical reactions vs. chemical reactions, properties of Carbon Dioxide, nucleation points.

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**littleBits**

**Suggested Location:**
This workshop can take place pretty much anywhere. It’s best to separate the groups a bit, but this can easily be accomplished in a classroom.

**Suggested Amount of Time:** 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

**Description:**
littleBits are fun interactive circuit connectors. Each bit has its own function such as power, input, output and extension. Students are guided through a series of design challenges using these bits. Can you make a flashlight? Can you make an alarm go off when a box is opened? Can you move this object using only littleBits? Watch how students become truly engaged while collaborating and problem solving using critical thinking skills. This activity takes learning about electricity to the next level by integrating technology that students use every day. Review and discussion wrap up the workshop.

**Learning Outcomes:**
Parallel circuits, basic robotic functions, basic circuit programming, electricity.

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Video Production

Suggested Location:
This will depend on the purpose of the visit and what’s available. Contact us for details.

Suggested Amount of Time:
Typically 1 hour is enough, but this workshop or video service is easily adapted to your needs. If scheduling multiple workshops on the same day, please allow for a 5-10 minute transition time.

Description:
Short Films: Students collaborate in small groups to plan and film a short video. They will come up with a story line and experience each step in the process of completing a video. Groups are typically challenged with a genre such as comedy, mystery, horror, etc. In addition, they’ll be given a theme and possibly a random prop to incorporate. Students will be taken through some editing basics, but final editing will be completed by the instructor at a later time. Once editing is complete, the finished shows will be provided in DVD form or on a flash drive. Students will enjoy watching their own work come to life as well as seeing the work of their fellow classmates.

Custom Video Projects: After School Programs, Class Projects, Video Contests, Family Appreciation Nights, and so much more. The instructor can work with you to put together a finished production for your event. During the production process, students are always involved and learning the steps to make a successful video.

Other services:
Green screen, aerial drone video / photography, slide shows, performance video, editing.

Learning Outcomes:
Digital media, art of storytelling, production process, functions of video cameras, basic digital editing, responsible use of technology.

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If groups complete a show / production, a completed DVD can be provided. Additional charge may be applied if lengthy editing is required.
Lights and Lasers

Suggested Location:
A classroom or open area with tables for student workspace with the ability to make the room dark. The laser show can be done in the classroom setting or as an assembly. Contact for details.

Suggested Amount of Time:
1 1/2 hours per workshop (including laser show). If planning the laser show separately, the hands on workshop is approximately 1 hour but the length can be customized. If scheduling multiple workshops on the same day, please allow for a 5 – 10 minute transition time.

Description:
The instructor begins the workshop with a series of challenges for students using 3 light sources (Red, Green, Blue). Casting beams of light over a surface, can you use a mirror and reflect the light in a certain direction? Using a trapezoid, concave and convex lenses, can you refract the light causing the beams to bend? Next, students experience mixing the colored light. How many different colors can you make? How is mixing colored light different than mixing paint colors? Several demonstrations take place using Xploration’s own laser machine. Now comes the laser light show which reinforces what the students just learned.

Learning Outcomes:
Light reflection, light refraction, light waves, mixing light colors, and persistence of vision.

<table>
<thead>
<tr>
<th>Suggested Grades</th>
<th>Workshop Capacity</th>
<th>Initial Session</th>
<th>Additional Sessions</th>
<th>Take Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 6</td>
<td>25 – 30</td>
<td>$150</td>
<td>$75</td>
<td>No</td>
</tr>
</tbody>
</table>

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Coding with Sphero

Suggested Location:

A classroom or open area with plenty of floor space. Depending on the number of students, there could be as many of 12 small areas located on the floor where students will be working.

Suggested Amount of Time: 1 Hour per workshop. Length can be customized. If scheduling multiple workshops on the same day, please discuss transition times with Jeremy. Additional charging time may be required depending on the size of groups.

Description:

Following a quick introduction to coding and how it’s used, the students dive right into it. Learning to code can be fun but most importantly, it prepares the students for the world we live in today. Students work in small groups equipped with a tablet and a Sphero robotic ball while trying to complete coding challenges. Using block programing, can you robot follow a path, push an object, hit a target and light up different colors?

Learning Outcomes:

Coding, understanding technology, angles, velocity (specific Common Core Math Standards can be met if desired.)

<table>
<thead>
<tr>
<th>Suggested Grades</th>
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<th>Initial Session</th>
<th>Additional Sessions</th>
<th>Take Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 – 7</td>
<td>25 – 30</td>
<td>$150</td>
<td>$75</td>
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</tbody>
</table>
Where to Find Funding for STEM Activities in Your Classroom

Paying for enrichment opportunities for your classroom can be a struggle. Here are some ideas for educators to try to locate funds for these and other programs for your students.

Contact your school’s Parent Teacher Organization

DonorsChoose.org is a United States–based 501 nonprofit organization that allows individuals to donate directly to public school classroom projects.

The Nashua Education Foundation offers grants to Nashua public school teachers to support enrichment projects not typically covered by public funds. For more information go to their website at www.nashuaeducationfoundation.org