An Intertribal Research and Resource Center Newsletter

Fall, 2019

Mission:

The IRRC provides services and builds capacity for enhancing food, energy, and water sustainability for tribal communities in the Northern Plains.

In this issue:

United Tribes® Technical College

Intertribal Research & Resource Center

Tribal Landscapes

Research and Resources for Food, Energy, and Water Sustainability

Solar Powered Pow-wow!

The atmosphere at the 50th Anniversary United Tribes Technical College International Pow-wow was already electric, but when the lights came on and they were powered by the Sun, things really became charged. The solar panels on the *Solar Roller*, UTTC's mobile solar STEM unit, had stored energy from the Sun during the day and used it to power the lights, charge cell phones, and even recharge electric wheelchairs during the pow-wow. The trailer was community-designed and built during a series of workshops with contributions from industry partners, Lightspring, Rock Industries, Sojourn Architect, Indigenized Energy, and several UTTC departments. A special announcement during the pow-wow recognized the efforts of these groups. Coming in summer 2020, the trailer will be loaded with innovative STEM outreach activities and traveling to community events across the region. A video of the event is available under educational resources on our website: www.uttc.edu/irrc

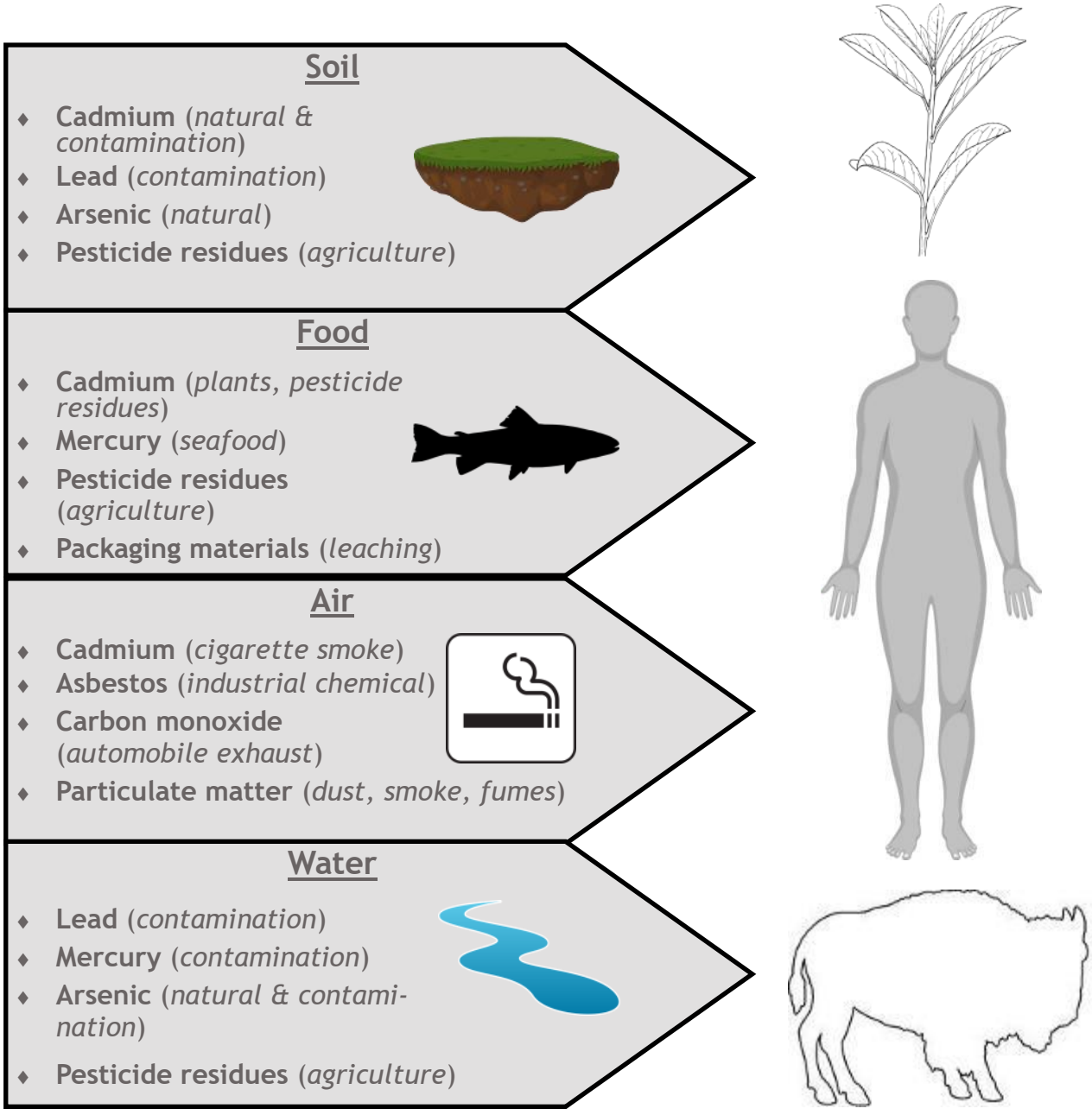
Funding is provided by the National Science Foundation (HRD-1839895)

RESEARCH

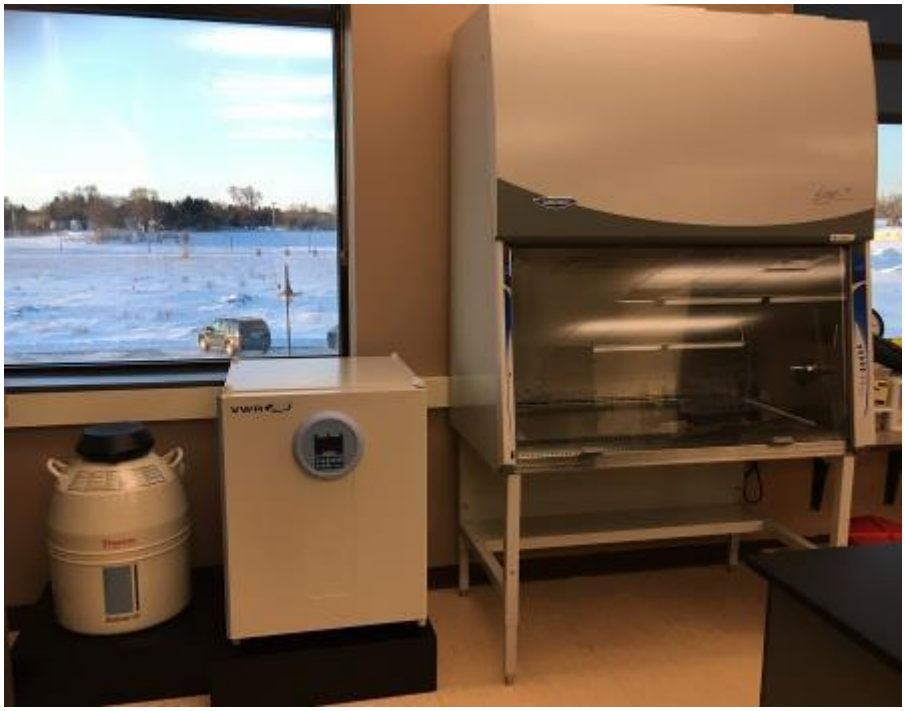
Environmental Toxicants

Who is exposed to environmental toxicants? All living things are! An environmental toxicant is any material, natural or synthetic, that is capable of causing an adverse effect on a living organism (Dong 2018). There is no simple or single way to categorize environmental toxicants. One way they can be classified is by site of exposure: food, water, soil, air, and so on. However, individual toxicants may fall into multiple categories, subtly revealing that living organisms, humans included, are exposed to multiple toxicants. Several environmental toxicants are regulated by federal, state, and tribal agencies, but this is not all inclusive. Therefore, further research is needed to address single toxicants and groups of relevant toxicants, especially those that can persist in the environment for long periods of time, to better understand their adverse effects.

Emily Biggane, PhD focused her graduate school research on the heavy metal cadmium and bladder cancer. This was performed using human bladder cells grown in the laboratory. She examined how cadmium contributed to making these cells cancerous by observing cell function, presence or absence of DNA instructions, and if the presence or absence of DNA instructions affected tumor formation. In her role with the IRRC, she will continue to study environmental toxicants and work with tribal nations to examine toxicants of greatest concern to their communities. More specifically, she will focus on assessing how environmental toxicants affect the mitochondria, the energy powerhouse of living cells, and potentially lead to cancer.



Lab Equipment Updates



Thanks to a grant from the National Science Foundation Tribal College & Universities program for enhancing lab safety and building research capacity, the the Analytical Laboratory at UTTC is being upgraded with instruments to grow cells for new research opportunities. These cells will be used to examine the effects of environmental toxicants on the proper functioning of the cells and if exposure to specific environmental toxicants can lead to cancer. On the right is the biosafety cabinet where the reseachers work with the cells. The glass, filters, and airflow create a barrier that keeps the cells safe from contamination and keeps the researcher safe from toxicant exposure. In the middle is the incubator where the cells "live" and grow. The environment inside is regulated and maintained at 37°C or 98.6°F, to mimic the human body. On the left is a cryogenic vessel that is used for long-term storage of cells to support sustainability of cell culture in the lab.

Student Research Competition

UTTC's Tribal Leaders Summit is a showcase of activities occurring across tribal lands in the region and an opportunity for students to connect with and learn from tribal leaders on a variety of topics. The IRRC and the Environmental Science Department co-hosted the first student research presentation competition at this year's conference. Students presented in a hybrid poster and oral presentation. Students presented on a wide variety of topics, including those listed below:

Muriel Friday *(Northern Arapahoe) - Alpha-glucosidase and its inhibitor in onion plants (Allium cepa)*

Berlin West *(Cheyenne River) - DNA sample validity in North Dakota bats*

Owen Smith *(Navajo) - MicroWatt energy production from microbial fuel cells*

Kimberlee Blevins *(Three Affiliated Tribes) - Alfalfa Leafcutter Bee (Megachile rotundata) emergence under varying oxygen levels*

K'lona Loften *(Cheyenne River) - Influence of diet on nitrogen, phosphorus, and potassium nutrients, organic matter, and carbon:nitrogen ratio in the vermicompost casts of the Eisenia fetida. (red wiggler worm)*

Abby Decoteau *(Turtle Mountain) - Using tornado debris signatures (TDS) to determine severity*

OUTREACH

EXPLORING CYCLES AND CHANGE IN THE GARDEN

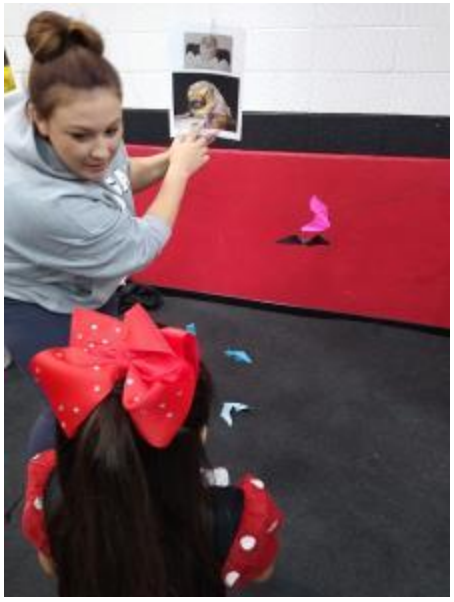
Theodore Jamerson Elementary 2nd graders spent the month of October trying to answer how a tiny seed can grow into a big pumpkin? To test their ideas they planted pumpkin seeds and recorded weekly observations of their growing plants. Each week students anticipated a tiny pumpkin would appear and were puzzled when this didn't happen. To dig deeper, they explored a mature pumpkin patch to look for other clues and watched time lapse videos to gather evidence for when a mature pumpkin would develop. In the end, they learned that a flower needs to appear before the pumpkin fruit can grow and of the importance of pollinators in helping transfer pollen for the plant.

Pumpkin plants are easy to grow and we encourage you to investigate with your own students or children. At the end of your observations boost reading skills by enjoying Pumpkin Jack, a science storybook written by Will Hubbell and a perfect companion to the Halloween season. Why do the observations before reading? This method of teaching is called the learning cycle and you can read more about how to implement it in this article: http://www.jminogue.weebly.com/uploads/1/8/6/2/1862257/perspectives_learning_cycle.pdf

The IRRC hosts monthly nature walks throughout the year to promote wellness while learning about plants, wildlife, and seasonal changes throughout campus. This fall, wildlife biologist and Center director Dr. Jeremy Guinn taught birding identification, NDSU graduate teaching assistant Hanna Karevold shared bat biology, and Land Grant agro ecology technician Robert Fox passed on cultural knowledge. We supplemented the walks with a Lakota field guide written by UTTC Native American Studies instructor Dakota Good House.

THE ROAD TO BECOMING A BAT SCIENTIST

The vision of United Tribes Technical College is to build the next generation of leaders who empower their communities. The students of the Environmental Science and Research program demonstrated leadership as they led science outreach for over 1,000 community members this fall. Abby DeCoteau (Turtle Mountain), Berlin West (Cheyenne River), Muriel Friday (Northern Arapahoe), Cody Guardipee (Standing Rock), K'lona Lofton (Cheyenne River), Kimberlee Blevins (MHA), and recent graduate Amy Jackson (Navajo) engaged participants in hands on activities to learn about bat research and the important roles bats serve in the ecosystem. Community events included Teddy Roosevelt Friends and Family Days, Bismarck Winter Market, and the Gateway to Science fall STEM Spectacular. School events included the Theodore Jamerson Elementary School Child Find Halloween Carnival and Wachter Middle School Native American Heritage Day.



TRAINING

Data Visualization Workshop:

Graphs don't have to be scary!

Dr. Emily Biggane led students and faculty from departments across campus through a hands on workshop on data visualization. Oxford Dictionary describes data visualization as "the representation of information in the form of a chart, diagram, picture, etc." The following two pages highlight the main takeaways from the workshop.

Why is Data Visualization important?

- Everyone uses data!
- Evolving world with more data and an increasing desire for data-driven decision making
- Simplifies the data
- **Allows your data to tell a visual story!**

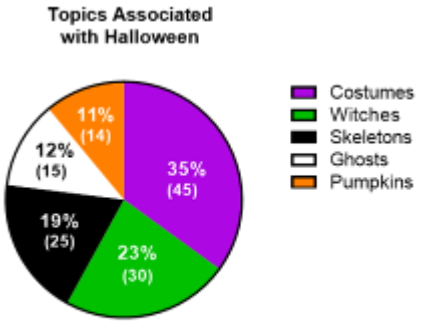


Figure 12. Pie chart showing the most common Halloween topic response from shopping mall patrons (n=129).

Table 1. Type of Candy Purchased for Trick-or-Treaters

Patrons	Fruity	Chocolate
Males (n = 30)	20	10
Females (n = 30)	7	23

Each patron purchased 1 bag of candy: fruity or chocolate.

Several Ways to Visualize Data

- **Table**
  - Read small amount of data
- **Figure**
  - See and simplify large amounts of data
  - Graph, diagram, picture, ect.
- **Consider which visualization is most effective for your data!**

Do

- Make important information obvious
- Consider which visualization is most effective
- Format to make table or figure stand alone
- **Let your data tell a story!**

Don't

- Remove necessary information
- Clutter tables or figures
- Make the reader guess how to interpret data
- **Be scared of tables and figures!**

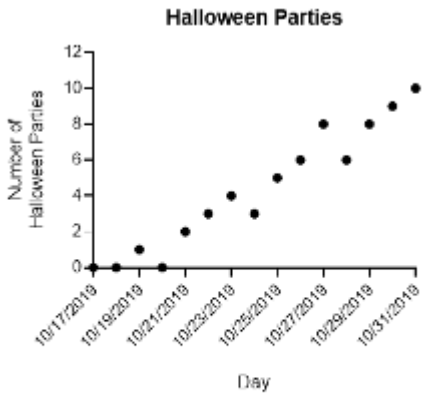
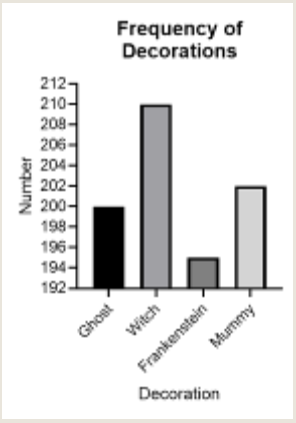


Figure 2. The number of Halloween parties in Bismarck, ND each day between October 17, 2019 and October 31, 2019.



The three graphs below have some common and misleading mistakes. Can you spot them?



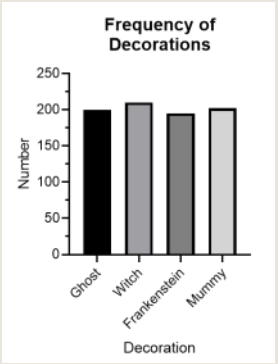
What is confusing about the total percentages pictured in the graph?

If you look at each category you will notice they add up to <u>188%!</u>

TIP: If multiple responses per person allowed, use a bar graph with numbers not percentages.

What decoration *appears* to dominate?

What do you notice about the vertical axis?



TIP: Always Start your axis at zero

What supplier *appears* to have the largest market share?

Now compare that to the actual percentages below.

TIP: Avoid 3D and include actual percentages

Creating in 3-D

IRRC faculty Dr. Gurjot Dhaliwal taught a pre-engineering course this fall. As a part of the curriculum, pre-engineering students learn computer-designing software (CAD). For their final project, they made 3D projects using CAD software, making their ideas and computer model a reality. The students were free to choose the projects based on their interests, which included a model of a space shuttle, a 2-story house, church, etc.

3D printing is an amazing learning tool that creates both excitement and a better understanding of the design process as they gain hands-on experience from conception to creation. The individual features are visible more clearly, as students build the project layer by layer. Excitement also stems from the ability to explore details in reality, not just on a screen or in a textbook. 3D printing also brings the world of theory to the physical world where students can see and touch their designs, opening up new possibilities for learning and activities.

Jerral Murray (Cheyenne River): hexagonal Box

Dione Otten (MHA): Working with CAD software to design a model church

Phillip Lewis Jr (Spirit Lake): Shark comb

Marcellus Barney (Navajo Nation): Sword

Marlin Chase (MHA): Space Shuttle

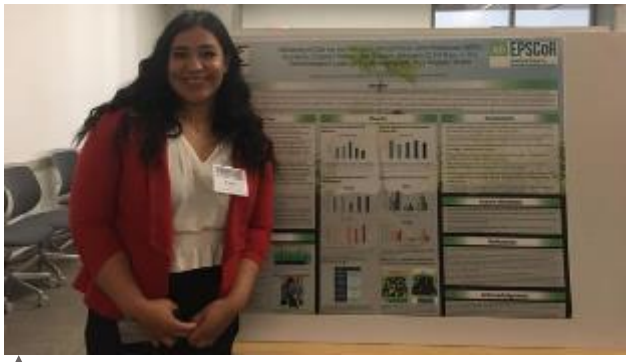
Taylor Brugh (MHA): 2-story home

Taking the Next Step!

Research is only meaningful if it is shared and UTTC STEM students have many opportunities to share their research results. During fall semester, students presented at local events, such as UTTC's Tribal Leaders Summit, and regional and national conferences, such as the North Dakota INBRE conference and the national AISES and FALCON conferences. Presenting provides students opportunities to practice professional presentation design, public speaking, and communicating the importance of their research to diverse audiences. These skills and the confidence they gain during these activities will be used throughout their careers. This is another example of why, at UTTC, ***Leadership Begins Here!***

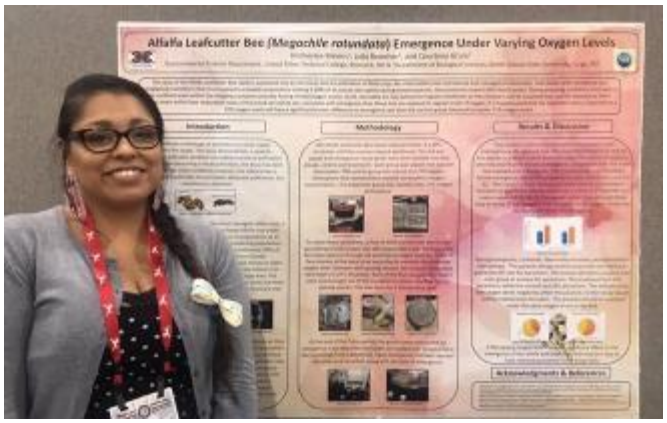
▲*Dionne Otten (MHA) presenting at AISES*

UTTC accepting award for best student chapter ▼



▲ *K'Lona Lofton (Cheyenne River) presenting at INBRE*

Muriel Friday (Northern Arapahoe) presenting at INBRE ▼



▲ *Kimberlee Blevins (MHA) presenting at AISES*

Berlin West (Cheyenee River) presenting at INBRE ▶

Environmental Science and Research students and faculty attending the FALCON Conference ▼

Collaborative Events

The Intertribal Research & Resource Center, Land Grant, and Environmental Science departments hosted a group from Tamera Ecovillage Community in Portugal to discuss sustainable communities, food systems, energy, and water. Six youth and three adults provided a presentation about their community. UTTC Thunder Society and Student Government members described issues of sustainability on tribal land in the region. The group ended the day by participating in an Inipi (sweat lodge) ceremony.

UTTC Environmental Science and Sustainable Ag students had a great time learning about research and networking with scientists at the USDA-ARS Tribal College Field Day at the Northern Great Plains Research Lab (Mandan, ND).

Students and faculty traveled to the Garrison Fish Hatchery to assist with the salmon spawning operation, which will produce salmon that will be stocked in ND's waterways next year.

Visiting Scientist Series

Dr. Emily Biggane presented her work to community members and area college students as part of the Visiting Science Series (VSS). The VSS was established to inspire and educate young people and the public about Science, Technology, Engineering and Mathematics (STEM). VSS showcases scientists working in a variety of fields, with the intent to reach a diverse audience and to inspire local students to consider careers in science. VSS also provides resources for educators, educates members of technical organizations, and informs the community on science and technical issues.
The Visiting Scientists Series is a partnership of Bismarck State College, Gateway to Science, Bismarck Public Schools, ND Society of Professional Engineers, Institute of Electrical & Electronics Engineers, State Historical Society of North Dakota, University of Mary, and United Tribes Technical College.

Land grant and Sustainable Ag students hosted a salsa canning workshop. Utilizing sustainably grown produce from the UTTC garden participants learned how to prepare and preserve delicious salsa to enjoy all winter long.

IRRC faculty and Environmental Science students and faculty participated in a wildlife damage workshop put on by USDA APHIS and gained experience using a rocket net, pyrotechnic devices, and visual deterrents. Thanks Dr. Alicia Andes for organizing this informative event!

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Upcoming Events

Biotechnology AP Prep Workshop
- Saturday December 7, 2019 9:00 am-5:00 pm
- UTTC Science and Tech Center, rm. 231
- Hands on training for science teachers in biotechnology techniques such as DNA extraction, DNA replication, and forensic DNA fingerprinting.

Winter Market
- Dec. 7th, Feb. 8th, Mar. 21, 10 am-2 pm
- UTTC James Henry Gymnasium
- Come visit our free STEM activity booth at the winter market! New activities each month.

Waníčhoka Wí STEM Pop Up
- Monday, Dec. 23rd 11:00 am-1:00 pm
- UTTC Cafeteria
- Winter themed STEM activities for the whole family. Free event open to the community.

Lunch & Learn
- Dr. Jeremy Guinn will lead a discussion on preparing to write a proposal—how to get from a want to an objective statement. TBA—winter 2020.

Science Seminar Series
- Every Friday at noon in Science & Technology Center room 231
- Guest scientist seminars sponsored by the Environmental Science Department

Contact Us:

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