Designing Culturally Responsive Makerspace Pop-Up Activities for Middle School Audiences

**DR. JENNIFER MILLER-RAY**  
@DRMILLERRAY  
SUL ROSS STATE UNIVERSITY  
Texas-Mexico Border

**Mr. Tom Tomas**  
thomas.tomas@littlesinger.org  
Little Singer Community School  
Winslow, Arizona
Today we will...

- Improve culturally responsive teaching in an informal makerspace environment through the development of makerspace pop-up activities and training approaches following a makerspace project-based literacy process;

- Increase scientific literacy achievement through informal hands-on makerspace pop-up activities focused on STEM and real-world problems;

- Describe opportunities and hands-on mobile approaches to build capacity of existing informal makerspace learning of remote communities, diverse learners, and STEM professionals serving underrepresented minority populations.
Culturally Responsive Values "Funds of Knowledge"

HTTPS://WWW.YOUTUBE.COM/WATCH?V=GKVHUUSDN1Q
Considering Culture as Design Element for Makerspace Kits or PopUp Activities
Reducing Bias via Informal Assessment of Makerspace Products and Reflections in e-Portfolios, Journals and Blogs
Valuing "Funds of Knowledge"

**Literacy**
competence or knowledge
Making Meaning

**Fluency**
ability to express oneself articulately with an understanding of how to reach a desired effect
Transfer of Knowledge
Scaffolding Approach

EXPLORATION

SKILL BUILD

PROJECT CHALLENGES: 4 STEM CAREER APPROACH
How are digital tools best integrated into makerspace projects to encourage improved digital literacy for middle school?
Transitioning from Explore to Emerging Technology Skills via Skill Workshops (Mentor Led)

- Drones
- Robotics
- CAD & TinkerCad
- 3D Printing
- Data Visualization
- Media Creation
- Video Technology
- Research ~ Media Literacy
- Code
- Web Design
- Infographics
- Podcasts
- Wearable Technologies
- AR/VR/XR
Materials for High and Low Tech Design of PopUp Activities

- Scissors
- Yarn and Textiles
- Paper Cutters
- Glue gun
- 3D Printer Pen
- Circuitry
- Video and Cameras
- Green Screen

- 3D Printing
- Virtual Reality/Augmented Reality/XR
- Code
- Drones
- Wearable Technologies
- Robot Kits
- Arduinos
- Raspberry Pi
Future Ready Skills Through Makerspace
Pop-Up Activities Can

- Mobile Activity
- Incorporate at Home, Outdoors, etc.
- Task Cards or Box as a Kit
- Challenges on Website as Virtual Option for Post COVID-19
- Challenge Students to Create Task
Encourage Literacy through Pop-Up Activities

Compose Ideas to Share With Wider Audience Informational Text

Inferencing Through Makerspace PBL Challenges (Pop-Up) Activity
Engagement is Key!

2012: STEM NASA Camp in Library for MMS

July 2019 Presidio Library on Texas/Mexico Border
Disciplinary Literacy Through Mentor Texts

- Interpreting Texts
- Composing and Revising Texts
- Helping students move across content areas by connecting literacies and integrating to real world scenarios

Disciplinary literacy refers to the specifics of reading, writing, and communicating in a discipline. It focuses on the ways of thinking, the skills, and the tools that are used by experts in the disciplines (Shanahan & Shanahan, 2012).
*Makerspace can Facilitate Disciplinary Literacy for Middle School Students

Combining Content (generic literacy of subject or content skills) and Disciplinary Literacy in Practice (inquiry) through making. COVID-19 presented opportunities to build upon “funds of knowledge” in disciplinary literacy (Makerplace).

- Provides greater access to assist struggling readers and writers.
- Engaging conversations about text they are provided greater access.
- Enhancing subject matter learning.
- Building critical literacy skills.

Pop-up activities facilitate greater learning, bridging family communities together for a rich experience through stories, STREAM*.

https://www.livebinders.com/play/play_or_edit?id=330317
Inclusive Mentor Texts
Mentor Text Digital Resources

Newsela
Absorbing daily news stories at
Kids just-right learning context

exploratorium

The Learning Network
Teaching & Learning With The New York Times

DOGONews
ELA - Science - Social Studies

Smithsonian
Science Education Center

CommonLit
Feature-rich literacy resource offers
superb support for readers
Host Community Events with Popup Activities

STEM Friday
Friday, April 26
10am-12pm
SRSU Library

SRSU Community members are invited to participate in being a(n):

Engineer  Scientist  Journalist  Artist

SRSU Library

For more information call 432.837.8019
An Example: Designing Pop-Up Activities via 4 STEM Career Stations
5 Diné (Navajo) Character Traits of Leadership inform our LSCS Makerplace.

5 Character Traits:
1. Kinship
2. Values
3. Mindfulness
4. Our words have life
5. Determination & True Grit

Growth-Mindset Model:
1. Seeds are planted
2. Plants have sprouted
3. Silk has emerged
4. Pollen has pollenated
5. Corn has been harvested
(Seeds are selected for planting & rest is eaten.)
Native Science Ethics and Principals

Science contextualized and informed by Navajo Culture shape how we apply STEM in our Project-Based Learning and Service Learning Projects.

This cultural compass is like a lens through which our students and teachers approach innovative projects.
The Ethics of Native Science: Providing Service to All Our Relations

- Caring for the Earth,
- Caring for the People,
- Sharing with Respect for All Our Relations.
Social Scientist: History of Flight

Research the Wright Brothers first powered airplane and design and make a replica/model to present and inform others about the Wright brothers’ and their contributions to the flight. First Powered Flight on Planet Earth

NGSS: MS.Engineering Design

ISTE: Creative Communicator, Empowered Learner

5DCTL: Determination, Perseverance & True Grit (Fall Forward) 5 Diné Character Traits of Leadership
Be a Investigative Journalist!

Create and make an investigative report on the Ingenuity Helicopter’s NASA engineer MiMi Aung.

3-2-1 Quick Write

3 things I learned:

a. I learned that if a helicopter doesn’t have a blade on the tail, they use two blades on top of the helicopter that goes in opposite directions.
b. The second thing I learned was that the higher the helicopter goes, the less dense the air gets.
c. The last thing I learned was that the blades on Ingenuity have to be at an angle to fly because of how less dense the air is as compared to here on Earth.

2 aha moments or wows:

a. An aha moment I had was when I found out that there are special helicopters that are made to go higher into the air than normal helicopters.
b. Another aha moment I had was when I found out that if there is no blade on the tail then they put two blades on the top that rotate in opposite directions.

1 question I have:

a. How does having the blades at an angle help Ingenuity fly?

NGSS: MS.Engineering Design

ISTE: Creative Communicator

5DCTL: Our words have life. 5 Diné Character Traits of Leadership
Design and make paper propeller to carry out the design process. How does air resistance impact the propeller? Compare the paper propeller to a crumpled up piece of paper.

NGSS: MS. Engineering Design

ISTE: Innovative Designer

5DCTL: (K’é) Relationships with the air we breathe

IDEA: Video flight in slow motion to compare/contrast.
Create art that compares images that the Wright Brothers would see from above, Ingenuity would see from above. Dragonfly would see from above.

Using a drone or imagination, compare the images above to your own backyard.

**NGSS:** MS-ESS3-2 Earth and Human Activity, Earth’s Systems

**ISTE:** Empowered Learner and Knowledge Constructor

**5DCTL:** (K’é) **Relationship-building** includes perspective-taking.
Be a Geologist

How does a lava flow work? Explore lava tubes and recreate one to measure a lava flow of liquid on a flat surface. Share your experiment design, hypothesis, and outcomes with a larger audience. What can we do on Earth that is similar to Mars exploration?

**NGSS:** MS-ESS2 Earth's Systems, MS Space Systems

**ISTE:** Empowered Learner, Knowledge Constructor, Global Collaborator

**5DCTL: Mindfulness...**

Being mindful of how we are shaped by our natural environment, and how we design the space and time we are immersed within.

*Q:* How does where and when we live shape who we are?
Be a Space Engineer

How might humans colonize Mars using lava flows? Make and design a habitat that could be used to colonize Mars in a lava flow. Imagine that the use a drone could be used to fly on Mars to gather data for NASA engineers.

**NGSS:** MS.Space Systems, MS.Interdependent Relationships in Ecosystems

**ISTE:** Innovative Designer Computational Thinker

**5DCTL:** Values for our umbilical-connection to hearth and home.
CRT Formative Assessment of Learning

- Journal
- Blog
- Portfolio/e-Portfolio
- Reflections on Character and Leadership
- Teamwork
- Design Process
- 3-2-1

https://futureready.org/ourwork/future-ready-frameworks/
Pop-Up Activities Impact/Resources

Example Makerspace PBL Process Challenge Cards for Pop-Up Activities using Low/High Tech Resources.

https://sites.google.com/view/steam-learning-lab/home

1975 Mobile Library for Rural Program

1st Mobile Makerspace Pop-Up 2015 with kids
Kennedy Space Center

Alpine Montessori School building windmill 2019 (above)

Bus Vision - NASA MMS Launch 2015 with Father of Digital Art, Laurence Gartel
Design a mobile pop-up activity for your community.

[Jamboard Activity]
Addendum

Ingenuity Mars Helicopter Landing Press Kit

Little Singer STREAM Program Expo
https://www.youtube.com/watch?v=jwYrYcWM3iI

Little Singer School gets bold new building
https://navajotimes.com/edu/little-singer-school-gets-bold-new-building/
Connect with Us!

DR. JENNIFER MILLER-RAY
Jennifer.miller@sulross.edu
@DRMILLERRAY
SUL ROSS STATE UNIVERSITY
http://www.drjennifermiller-ray.com/

Tom Tomas
thomas.tomas@littlesinger.org
Little Singer Community School

Questions are the path to learning