



AURORASAURUS

Reporting Auroras From the Ground Up



# QRV: Newbie YL Perspectives on Becoming a Ham Citizen Scientist

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Dr. Elizabeth MacDonald KJ7RUB, Aurorasaurus/NASA

Laura Brandt KC3QGP, Aurorasaurus/New Mexico Consortium

Connie Atkisson KE8PUG, 4th Grade Teacher,

Detroit Public Schools

“To survive, amateur radio needs young adults who enthusiastically embrace our form of radio communication.”

—David Vine WA1EAW,

“The Language of Amateur Radio” HamSci 2020

“To survive, amateur radio needs  
new participants who  
enthusiastically embrace our  
form of radio communication.”

—David Vine WA1EAW,

“The Language of Amateur Radio” HamSci 2020

# This Community ROCKS.

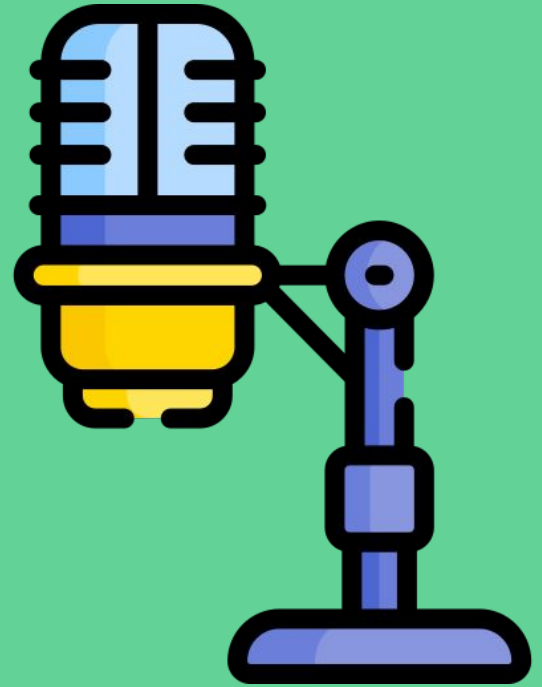
- You research science!
- You volunteer!
- You are tech-savvy and flexible!
  - HamSCI2020
- You are experts!
- You are welcoming Elmers!
  - You make an effort to help us feel comfortable



Image from HamSCI Facebook page

# Why did you become a ham?

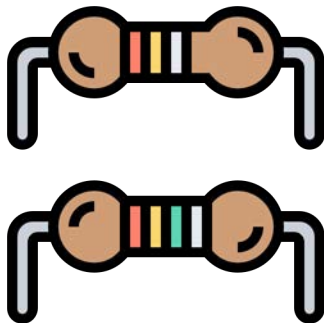
*Hypothesis: the answers are as  
broad as ham radio itself...  
discussion to follow*



# An open secret - why a granddaughter might not want to be a ham

## On the one hand...

- History & sexism - YL cringy
- Privacy & safety concerns
  - Homophobia & doxxing
- Subcultures/offensive channels
- Sparse active college clubs
- Pandemic - no in person activities, virtual learning difficulties
- Lack of time, money, modern entry-level pathways
- **Different motivations**



## On the other hand...

- Extremely welcoming adaptable tech-savvy community
- Big scaffolding gaps (also in aurora community)
- Difficulty correcting misconceptions (also in aurora community)
- Acknowledge all of the expertise in the room



# Call signs can say too much

For some women and minorities, sharing location can be a real risk

Doxing is when “one or several person(s) (doxer/doxers) **seek private or personal identifying information** about another individual (subject/target) and widely distribute it....A dox is typically accompanied by a subtle or overt call to action, typically to harm the target....While both women and men experience doxing, **women, especially women from vulnerable minorities, are more likely to have their private information posted online** and receive greater amounts of unwanted, vitriolic messages....**When physical environment information is revealed, the target can be subject to offline harassment, which can escalate into physical danger.**”

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Eckert, S., & Metzger-Riftkin, J. (2020). [Doxxing](#). The International Encyclopedia of Gender, Media, and Communication, 1-5.

# Language is always changing



young la·dy

/yəNG 'lādē/

*noun*

noun: **young lady**; plural noun: **young ladies**

a woman who is not far advanced in life; a girl.

- a form of address used by an adult to a girl, often in anger.  
"I don't know what's got into you, young lady"
- **DATED**  
a girlfriend.

Definitions from Oxford Languages

"For people who use that phrase, I think what they have to understand is, even when it's said with affection, **the reality is that it is dismissive**. Some male colleagues may think that it's a compliment to say that somebody's a young lady, but it's not. **There are lots of ways to compliment women of intelligence and substance, and calling them young lady is not one of them.**"

US Rep. Pramila Jayapal in an [interview](#) with *Vice* after a 2017 incident in which an older male colleague dismissed her as a “young lady” during a debate. Afterward, he apologized for using such language.

# The scary side of ham radio



**"Some ham discussions can be misogynistic and highly political - e.g. SSB phone activity in the 75 meter band. These triggered large worries for us as parents of younger budding scientists and potential members of the hobby."**

**The overall effect is unacceptable and is a barrier to broad participation. To make progress, these problems need to be addressed directly at a community level."**

**Dr. Phil Erickson [Assoc. Director, MIT Haystack Observatory;  
CEDAR Diversity, Equity, and Inclusion committee]**



# Time & Money Limit Participation



## Disposable Time

Weeks to months to study for exam  
Add in time to learn required math  
Add in time to learn required physics  
Add time for exam

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MANY hours for a full beginner

## Disposable Income

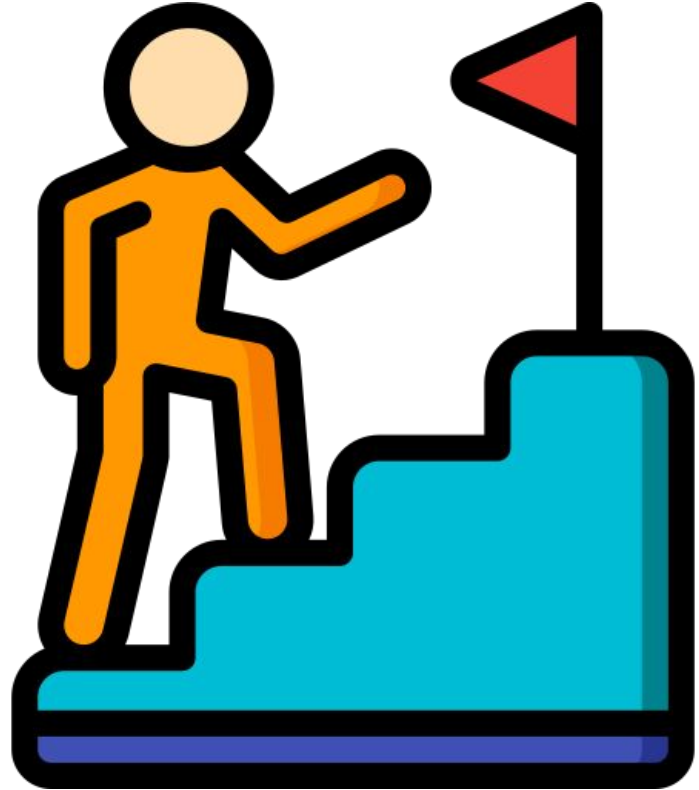
\$30 hard copy textbook  
\$35 exam fee  
\$40 basic handy-talkie (minimum)

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\$105 minimum to be a  
Technician-level ham

# Scaffolding for Understanding

- Building a scaffold structure of information
  - You have to build the most basic part of the scaffold before you can go higher
- Like stairs, learning happens in stages
  - If you jump too many at a time the learner trips up and doesn't grow



# 93%

Of US adults report some level of math anxiety

Luttenberger S, Wimmer S, Paechter M. Spotlight on math anxiety. *Psychol Res Behav Manag*. 2018;11:311-322.

Published 2018 Aug 8. doi:10.2147/PRBM.S141421

# Jargon

- Helps solidify community identity
- Can also block new learners from accessing information/ community identity
- Try the Up Goer Five Challenge!  
(xkcd.com, Randall Munroe)
  - How can you explain ham radio in the most common words?



# Suggestions

- To address location privacy
  - Either the FCC hides addresses or clubs could offer P.O. Boxes to member
- To address the scaffolding and complexity - The Liz List - a modest proposal
  - A spreadsheet system for Ham Radio activities that self-rates complexity, time, cost, skills, and other details to allow people to understand what they are getting into and optimize for their interests, and allow projects to advertise. Ultimately helps everyone find a good fit.
    - e.g. is soldering required, is it Baofeng-able, is a license required, is it Mac-friendly, is the software open-source, is the software maintained?
- Helps to acknowledge these opportunities, everyone's problem
  - criticism of systemic issues, not of individuals
  - It's ok to feel uncomfortable

# Thank you!

- For all your help with our becoming hams
- For taking time to listen to and consider the thoughts in this presentation
- For being an awesome community!
- Participate in furthering this discussion

# Resources & references: General

[“Ham it Up: On the Air!”](#) Aurorasaurus blog post

[“Why Everyone Should be a HAM Radio Operator”](#), Arcadia Publishing

[Practice Amateur Radio Exams](#), QRZ

Jennings, Lee, [Ham Radio History \(slideshare.net\)](#)

Spikes et al., [Got Jargon? Making the Most of Q-Signals and Prosigns](#)

Vine, David WA1EAW, [“The Language of Ham Radio”](#), HamSCI 2020 Conference

Citizen Science Projects:

- [HamSCI: Ham Radio Science Citizen Investigation](#)
- [Radio Jove](#)

[WIRED 5 Levels of Science](#)

# Resources & References: Students & Safety

[“Kids and Ham Radio”](#), TWiT Tech Podcast Network, YouTube

[Introduction to Amateur \(Ham\) Radio - For Elementary School Students ... \(slideshare.net\)](#)

[www.HamRadio.world](#): Ham Radio Resources for Kids

[Curriculum Connections and Benchmarks \(arrl.org\)](#)

[Amateur Radio in the Classroom \(arrl.org\)](#)

[ARRL Amateur Radio in the STEM-Classroom 4.16.pdf](#)

[TechDirections magazines: Tech Directions and The Education Digest](#)

[How Ham Radio Clubs Help Students Learn Technology and Science Skills - Education Beyond Borders](#)

[3 Ways School Safety Can Be Improved By Technology - Education Beyond Borders](#)

[“Ham Radio Emergency! Using Public Safety Frequencies,” K6UDA, YouTube](#)

# Resources & REferences: The General Public

Carroll, Sean, [Physicist Explains Dimensions in 5 Levels of Difficulty](#), Wired, YouTube

eHowEducation, [How to Do Addition & Subtraction in Exponential Notation : Math Lessons & Tips](#), YouTube

Gardner, Howard (1983), Frames of mind: The theory of multiple intelligences. New York: Basic Books.

Gonick, Larry, [The Cartoon Guide to Physics](#), HarperCollins

Luttenberger S, Wimmer S, Paechter M. Spotlight on math anxiety. Psychol Res Behav Manag. 2018;11:311-322. Published 2018 Aug 8. doi:10.2147/PRBM.S141421

[Math Solver App](#), iOS & Android

McLogan, Brian, [Dividing a integer by a radical](#), YouTube

Monroe, Randall, [US Space Team's Up Goer Five](#), xkcd

Tayal, Saral, [OHM's Law in 3 minutes \(Beginner friendly\)](#), YouTube

Tibees, [Logarithms explained Bob Ross style](#), YouTube

[The Up-Goer Five Text Editor](#), Splasho.com

# Accessibility

Disability access

Social access

Economic access

What are the barriers to entry for ham radio?

How can we address those?

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# What is informal education?



# Who is the general public?

- Anyone!
- Everyone!
- Kids
- Adults
- Multigenerational groups
- People who took time out of their life to seek out what they can learn from you
- Remember: they *chose* to spend time with you

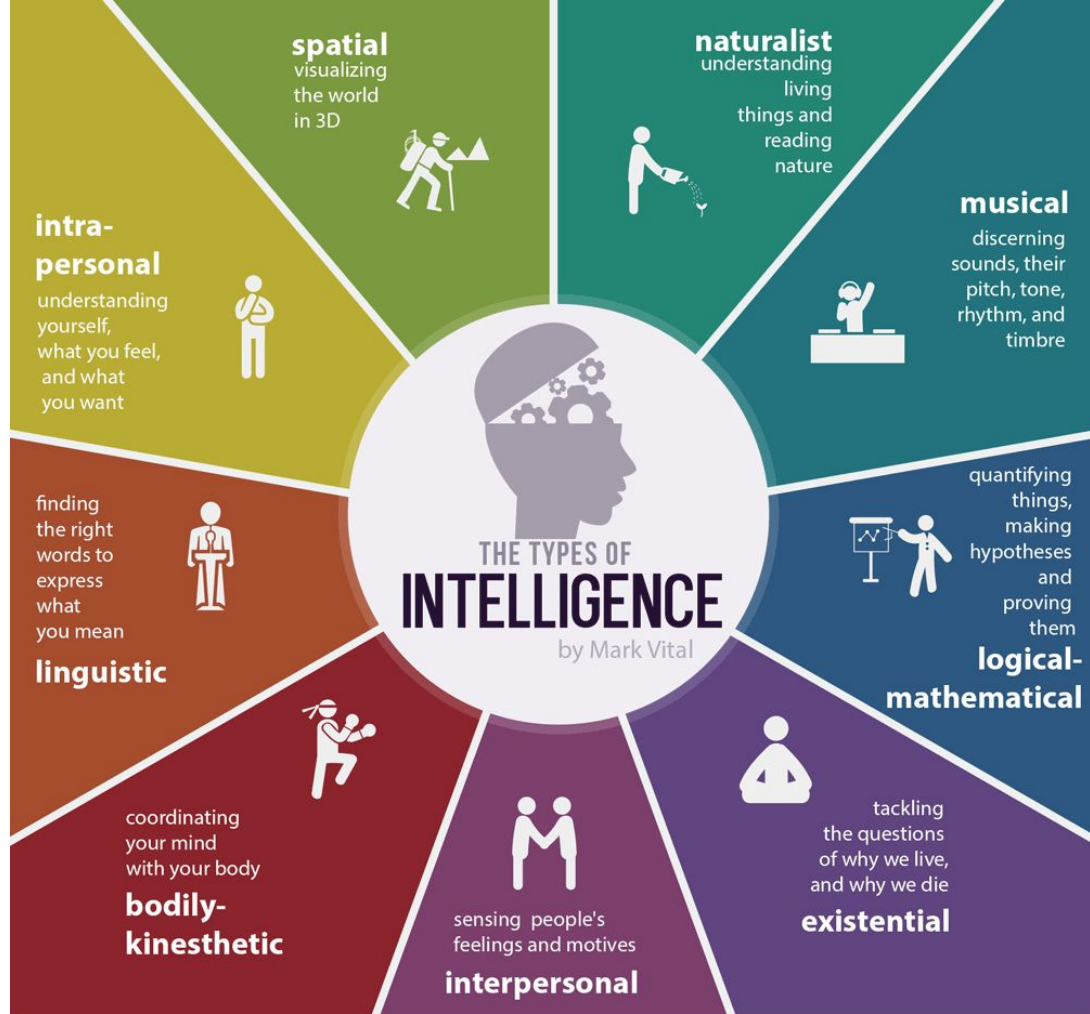


How can we get the  
general public  
excited about ham  
radio?



# Howard Gardner's Multiple Intelligences

- Western society tends to prioritize 1-2 ways of being intelligent
- There are *lots* of ways to be smart
- Different people have different intelligences
- To reach lots of people, engage lots of kinds of intelligence so they see their own



# Find a hook

- Enthusiasm is contagious
- What is really cool about ham radio?
  - Boil that down to a fundamental form
- What are places ham radio crops up in pop culture, sports, etc?
- “What if I told you you could talk to the International Space Station?”

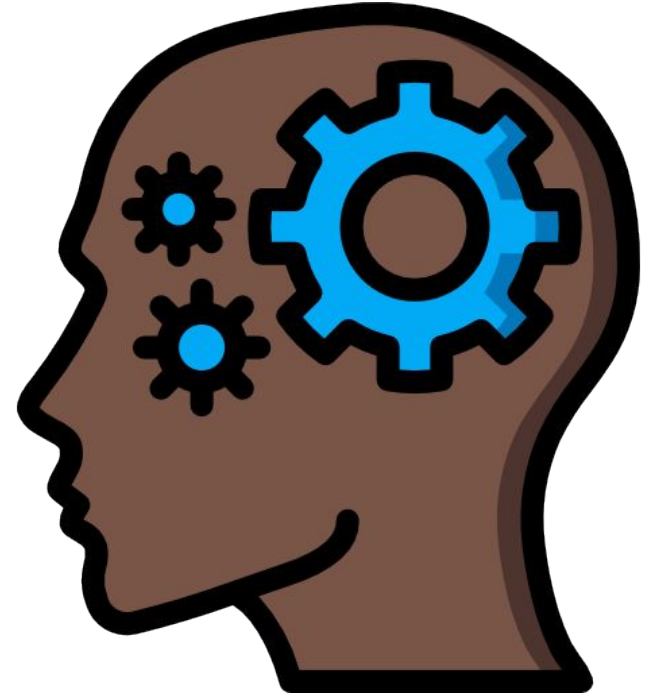


In the 2017 reboot of Disney's *DuckTales*, Della Duck mentions her ham radio

*Screenshot from season 2 episode 23: "The Richest Duck in the World!"*

# Entrance and Exit Narrative: Know Your Audience!

- Everyone comes into a scenario with a wealth of their own experience they can apply to it
- (This is one of the things that makes citizen science amazing!)
- It's important to gauge what someone comes in with: “entrance narrative”
- Can compare with what they leave with: “exit narrative”



## Assume a 5th-8th grade level

- Talking to a broad audience, we want to be able to talk to everyone
- Not everybody does high school
- Not everybody who went to high school remembers what they learned in math and science
- Cardinal rule: *never* make someone feel stupid. It closes doors to learning. Validate all answers before continuing
- What Connie talked about applies to the general public



# HAM RADIO JOURNEY

Dr. Liz MacDonald

KJ7RUB



# INTRODUCTION

- **Citsci leader Aurorasaurus/Heliophysics/Physics PhD**
  - Compare Aurorasaurus/HamSCI/RadioJove/EclipseMob and utilize my citsci & helio background to make connections
  - Focus on rural areas & solar max/eclipse events
- **Simple, low cost, easy, accessible**
  - Ham radio is not these things... lose the big picture. Too much choice
    - Speaking a different language, spending \$\$\$\$ / time, building and programming your own, very complex, and dominated by older white men
- **Wonderful community with tons of expertise and willingness to share**
  - Insular language, hard to join, few peers
    - Many hours to take test(s) if you're not a physics or EE major
- **We like a challenge!**
  - Can still contribute / have an impact with different ways of thinking



# PERSONAL GOALS

- Learn useful stuff to stay in touch/safe off-grid in the very remote mountains of WA/OR
  - Fancy mobile and HT rigs cost a lot. Need general and HF to do this best? Even more money.
  - For now, I'm trying HT for connectivity followed by a Quad band mobile rig that can do 6 m/10 m
    - Decided stick to Tech license for now
  - New Chinese radios exciting and cheaper but may not be legal or as easy to use
    - Baofeng can do APRS plugged into smartphone
    - Digital modes?
- Learn useful stuff to connect to Hamsci and have compatible citsci for eclipse and solar max
  - Speaking two different languages, and different frequency bands
  - Hamsci primarily HF – mostly requires General.
  - Hosting receivers in remote areas – how hard?



Comparison chart (not finished) – all different frequencies – listening only is OK!

- HamSCI / Personal Space Weather Station
  - Build your own
  - Very advanced – general recommended
  - Interoperable datasets is important
  - Expanding to aurora – maybe contesting – still needs work to span gap
  - Has critical mass/has community engagement
- Radio Jove
  - \$200+ kit - no license required
  - Listen to the Sun and Jupiter
  - How to get started? Do you need a radio quiet zone?
  - Feedback?
  - Useful for sprites / disruptive innovation
- EclipseMob
  - Previously cell phone dongle. Needed more time to develop interface to get good data. Feedback.
  - Next eclipse, Raspberry Pi kit.
  - Support, entry level, low cost, no license required
- Course has been wonderful. Ham radio should be taught to physics majors! Good exposure for students too but very likely out of reach of general audience and most teachers.



# NEXT THOUGHTS

- Start with the basics, i.e. VHF propagation, seeing the effect of altitude, seeing the effect of day/night, contests (can influence modes) and logs, listening/propaganda?
  - Non-trivial test, non-trivial language
  - Overwhelm and barriers and pandemic, hard to learn, hard to keep big picture in mind
    - Helps to acknowledge, everyone's problem.
      - Denying, gaslighting, mansplaining, feeling hurt, ad hominem, criticism of systemic issues, not of individuals
    - What freaked me out about ham radio
      - Websites, politics, YL, doxing, gatekeeping (oh when you gonna upgrade?), sexism, give different people the benefit of the doubt!, language, cost, unclear what you get for the cost
    - Best things: community, skills, space weather, college clubs (physicist), adaptability/diversity/challenge
- Next,
- Ranking system prototype "Liz's List"
- Soldering, homebrew, digital, Extra only, HF, Mac friendly, Baofeng/HT doable, listening only, new protocol, DX (logs required), contesting, programming required, cost of equipment required, <\$100, <\$500, <\$1000, "modern", "classic", science, emergency use, beginner, intermediate, advanced (complexity/time/skill)
  - Contests can't do
  - SSTV easy
  - Hamsci? Echolink
  - Tell me some examples
  - Tell me up front the cost and license requirements and whether they sponsor your video. In the website, tell me the requirements for success and DATE the verified notes and tutorial.

