Lesson Plan*

LESSON TITLE: Cybersecurity and Homeland Security Skills: Can Students Help When the Grid Fails?

SUMMARY:

This workshop introduces students to meaningful Cybersecurity projects which will contribute to student knowledge and skill sets which will educate and prepare the students for a power grid or communications failure (terrorist or natural disaster attack). Imagine if your local power grid and cellphone failed and you were left standing in the dark and isolated without telephone or Internet access?

This workshop provides answers and offers communications preparation resources and solutions. Prepared and FCC-licensed students saved lives and quickly helped police and emergency communications. Students were using hand-held communications equipment to help the police!

GRADE BAND:

- ☐ K-2
- ☑ 6-8
- ☐ 3-5
- ☑ High School

TIME REQUIRED: 120 minutes

LESSON LEARNING OUTCOMES: Upon completion of this lesson, students will be able to:

Outcome Examples

Design/Build Test/Defend Compare/Contrast Apply/Use Explain/Discuss Identify/Describe	1). Design and Defend your local Power Grid and Communications Network 2). Apply and use your knowledge of emergency communications during disasters 3). Participate in local emergency communications and FCC-License ARES Club 4). Identify and explain wireless signals & modulated spectra 5). Describe why knowledge of mathematics is fun and decode encrypted messages 6). Demonstrate how engineers actually develop cellular and satellite smartphones!

Materials List (i.e., string, digital diary, raspberry pi, web link, drone):

Internet access, web browser, audio headset (recommended) or speaker, web links (below), digital diary.

Added STEM tools for motivating students to pursue a STEM education:

Professor Joe Jesson introduces to students the amazing ADI ADALM-PLUTO cellular and satellite smartphone development kit! This is the development tool of choice of engineers while developing wireless smartphones and Internet-of-Things devices!

Describe any Previous Knowledge that may be Required:

Problem Solving Skills, Basic Science & Math Skills, interest in STEM

How will you facilitate the learning?

- Describe the Warm-up Activity:

The power grid and cellphone, and Internet failure actually happened Sept 20th, 2017 as Hurricane Maria struck Puerto Rico with 155 mph winds! Present slides & Walk Around (ask students questions):

"HUMANITARIAN ASSISTANCE IN PUERTO RICO POST-HURRICANE MARIA"

- Describe the Focused Activity:

1). Initiate Q & A FCC Licensing Online Quiz offers the student flash cards linked to actual FCC questions from the question pool, online quizzes with grading, and automated repeat of subject matter as measured and needed to review:

Online Wireless Quiz: https://hamstudy.org/

2). Introduce signals analysis using online visualization (Spectrum FFT and Spectrum Waterfall) and discuss how various modulation occurs also using online visualizations and audio demodulation in various languages. Discuss how an RF Spectrum Server functions:

Signals Analysis Server: GITHUB: https://github.com/simonyiszk/openwebrx

Signals Global Map: https://sdr.hu/map

- Describe the Teacher Instruction:

Presentations and DHS Recommendations:

1). https://spectrum.ieee.org/static/special-report-puerto-rico-after-the-storm

2). Threats to Pharmaceutical Supply Chains:
https://www.dhs.gov/sites/default/files/publications/508%20-%20AEP%20Pharmaceutical%20Final%20w-DS%200792018.pdf

3). 2017 Hurricane ARRL Report:
http://www.arrl.org/files/file/Public%20Service/ARES/2017%20Hurricane%20Season%20AAR.pdf

Mapping to GenCyber Cybersecurity First Principles:

☐	**Domain Separation**	☐	**Abstraction**
☐	**Process Isolation**	☐	**Data Hiding**
☐	**Resource Encapsulation**	☐	**Layering**
☐	**Modularity**	☐	**Simplicity**
☐	**Least Privilege**	☐	**Minimization**

Mapping to GenCyber Cybersecurity Concepts:

☑	**Defense in Depth**	☑	**Availability**
☑	**Confidentiality**	☑	**Think Like an Adversary**
☑	**Integrity**	☐	**Keep It Simple**

Assessment of Learning:

TYPE (Examples listed below)	**NAME/DESCRIPTION**
Quiz/Test Presentation Project Writing Assignment Observation Walk Around Oral Questioning Other	A number of assessment approaches will be adopted: 1). Presentation of multiple cybersecurity and natural disaster scenarios 2). Oral questions and walking around 3). Q & A online and answer discussions

Accommodations: (Examples may include closed captioning for hearing impaired students; accommodations for students with disabilities.)

N/A

Describe any Extension Activities (i.e., ideas for further work):

1) Join & Participate:

** Indiana County Emergency Management **

FCC Training & License Testing: https://www.qsl.net/w3bmd/

Contact: N3QM, Bill McMillen, 724-397-2702, wkmcmillen@gmail.com

*********NOTE: YOU can help your local community!

Acknowledgements: