

INTEGRATING GEOSPATIAL TECHNOLOGY WITHIN NAVAL STEM EDUCATION INITIATIVES

Capstone Project Proposal

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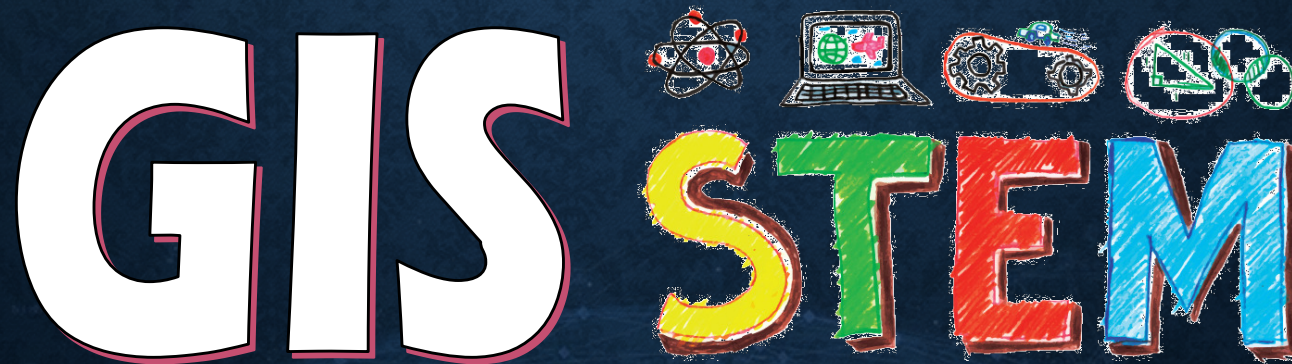
Department of Geography | GEOG 596A - Spring 2 2023



BACKGROUND

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- STEM and GIS can be incorporated into just about any class. It especially creates possibilities for cross-curricular projects.
- In STEM the idea of project-based real-world learning matches with the capabilities of GIS.



TEACHING WITH GIS

- Teaching with GIS employs an inquiry-based, problem-solving approach to learning that also promotes valuable spatial thinking skills. This approach not only benefits the teaching of geography but also science, technology, engineering, and mathematics (STEM), as well as the humanities.



“Today, spatial thinking is more relevant than ever before as issues such as climate change, economic globalization, urban sprawl, biodiversity loss, sustainable agriculture, water quality and quantity, crime, cultural diversity, energy, tourism, political instability, and natural hazards grow in importance on a global scale but also increasingly affect our everyday lives.”
– Joseph Kerski, ESRI

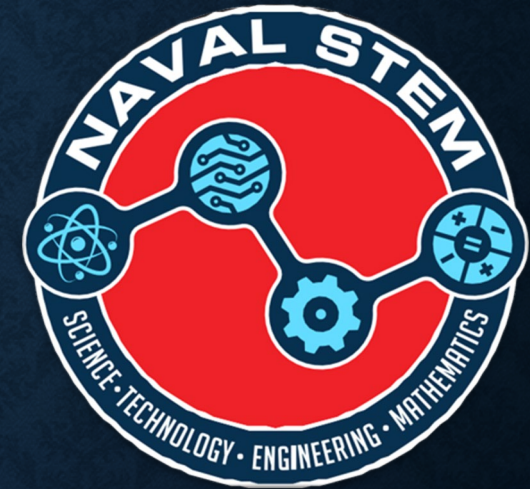
NAVAL STEM

- The Department of Defense (DoD) has long supported STEM education and outreach activities throughout the nation.
- Naval STEM supports the Department of the Navy (DoN)'s Navy and Marine Corps education and outreach programs.



NAVAL STEM

- Three focus areas of Naval STEM programs include:
 - Inspiring, engaging, and educating the next generation of scientists and engineers, technology professionals, and medical professionals
 - Employing, retaining, and developing a diverse civilian and military technical workforce
 - Collaborating across the Naval STEM communities and with other agencies to maximize benefits to the DoN



“

**LET US STATE IT UP FRONT AND IN
UNMISTAKABLE WORDS:
STRONG NAVAL STEM EFFORTS ARE
CRITICAL TO AMERICA'S FUTURE, AND
ARE A MATTER OF NATIONAL SECURITY.**

”



-Chief of Naval Research Rear Adm. Lorin Selby, Naval STEM Executive

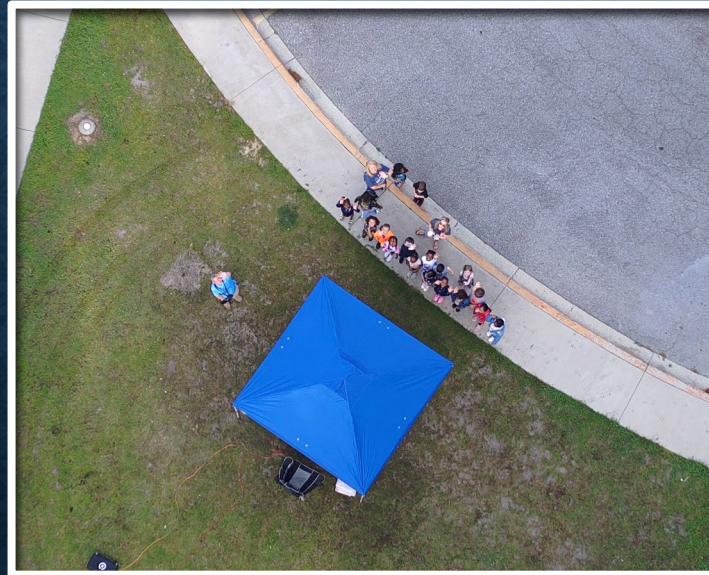
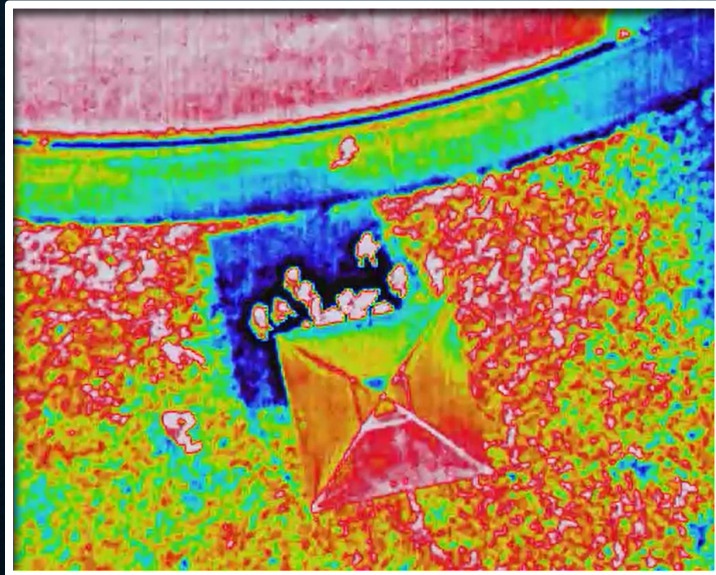
GIS STEM ACTIVITIES

- Children learn in a variety of ways, but **visual learning** is especially effective. Using maps in the classroom illustrates geographic context, helping students connect lessons with real places.

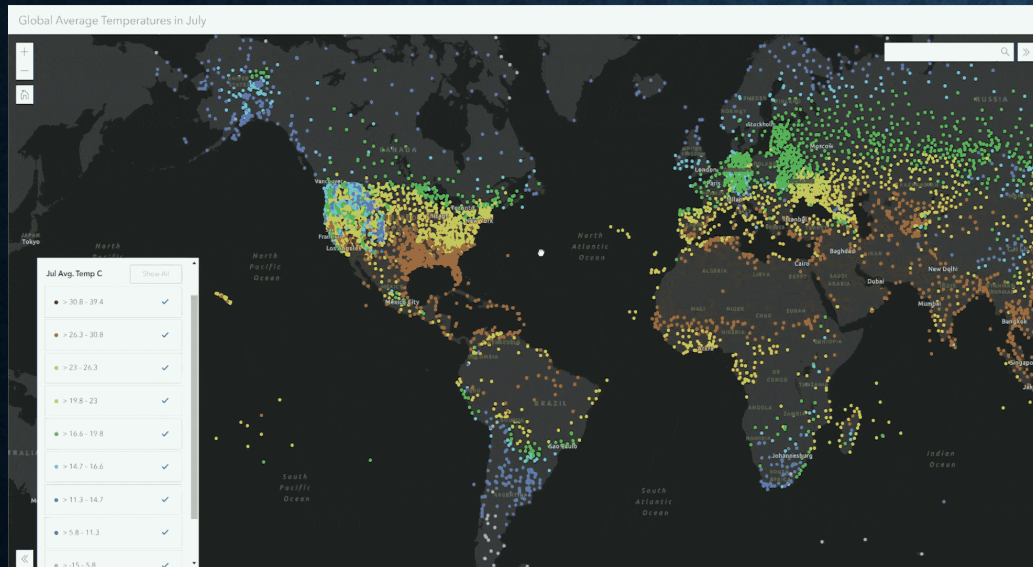


GEOSPATIAL TOOLS ENHANCE STEM ACTIVITIES

- Promotes student engagement and develops critical thinking skills.
- The “rise of drones” has captured the attention and imagination of students worldwide, enabling geospatial technology to be placed in the hands of students of all ages using an engaging and fun 'toy.'



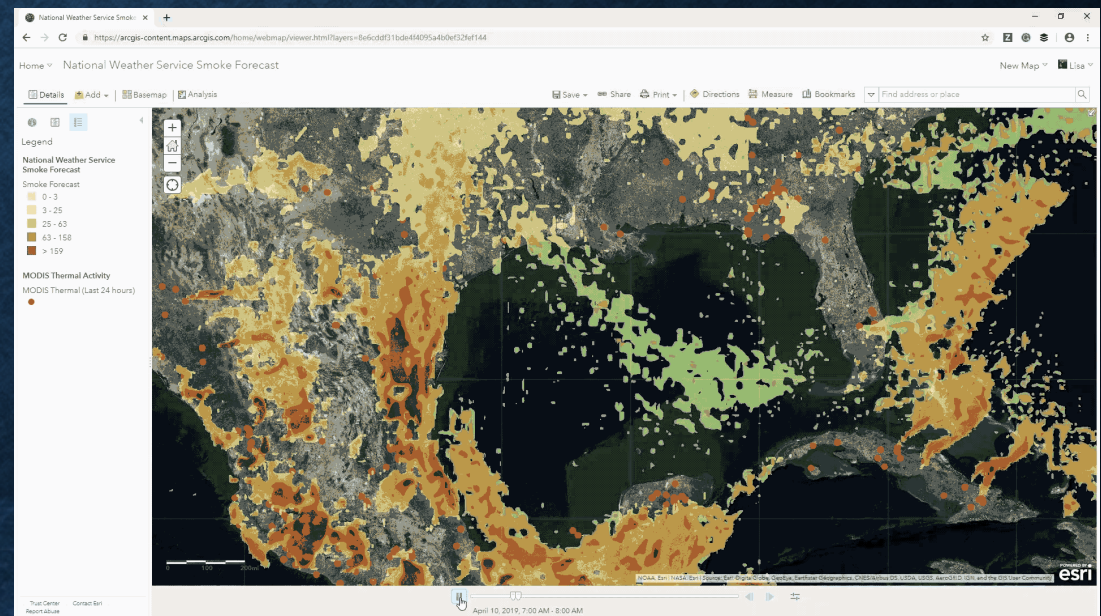
FREE GIS SOFTWARE (FOR EDUCATORS)



A school subscription provides additional security, privacy, and content features.

Learn more about ArcGIS Online and the school subscription at <http://www.esri.com/schools>.

ArcGIS Online is a mapping platform freely available to public, private, and home schools.



EXAMPLES OF GIS STEM ACTIVITIES

GIS Scavenger Hunts

The dashboard displays a satellite map with various filters and data visualizations. A 'SPEED LIMIT 30' sign is highlighted on the map. The interface includes a sidebar with filters, a main map area, and several pie charts at the bottom representing different data points.

D-Day STEM GIS Activity

This collage features a military aircraft with 'D-Day: A GIS STEM Activity' branding, a classroom setting with students, and a group of students working on laptops. Text overlays include:

- D-Day: A GIS STEM Activity Lesson Overview** by Mary Huffman and the Department of Defense including Todd Remmel.
 - For grades 5 and up, but can be modified and used with lower elem
 - Completed in one class session by integrating social studies, reading
 - There are 10 different "paths" (military regiments) to choose from an State Learning Standards.
 - These are the 10 military regiments: US Army Paratroopers, Engineers, US Army Easy Company, The Glider Infantry, Am Deception Operations.
- Key for differentiation of mission cards for the 10 regiments who foug**
- French Resistance Fighters-below 5th grade level**
- Deception Operations- below 5th grade level**
- D-Day Exposed: Using GIS Mapping and Project-Based Learning to Reveal the Whole Story**

Fundamentals of GIS & Location Intelligence

This collage includes a 'Map Exercise #2' with a legend and instructions, and photos of students participating in a floor map activity.

- Map Exercise #2**
 - You should have 4 pieces of paper. Each color represents the following:
 - State where you were born (pink)
 - State of your favorite trip/place visited (blue)
 - State where a friend/relative lives (green)
 - State you want to visit (yellow)
 - On the floor map, place your pieces of paper within the appropriate states. *Please be careful and walk slow so you don't move other papers.*
- Legend:**
 - Birth State (pink)
 - Favorite Trip (blue)
 - Friend or Relative (green)
 - Want to Visit (yellow)

TRACKING STEM ACTIVITIES

- The Office of Naval Research (ONR) manages the Department of the Navy STEM coordination office, to foster student interest in the sciences and hence build the future science and technology workforce.
- ONR requires Naval labs to track and report STEM outreach metrics; Naval STEM is continuously assessing which projects to grow, sustain or reduce.



CURRENT PROCESS

	NSBE			0	CHS			0	HR			0	NOLA			0	CHS			0	HR			0	NOLA			0	PM/Unknown charges
	CHS	HR	NOLA		CHS	HR	NOLA		CHS	HR	NOLA		CHS	HR	NOLA		CHS	HR	NOLA		CHS	HR	NOLA						
Number of team members				0				0				0				0				0				0					
Number of paid labor hours				0				0				0				0				0				0					
Number of unpaid labor hours				0				0				0				0				0				0					
Elementary School Students				0				0				0				0				0				0					
Elementary School Teachers				0				0				0				0				0				0					
Middle School Students				0				0				0				0				0				0					
Middle School Teachers				0				0				0				0				0				0					
High School Students				0				0				0				0				0				0					
High School Teachers				0				0				0				0				0				0					
Undergraduate Students				0				0				0				0				0				0					
Masters Students				0				0				0				0				0				0					
PhD Candidates				0				0				0				0				0				0					
Postdoctoral Students				0				0				0				0				0				0					
University Faculty				0				0				0				0				0				0					
Funding:																													
OH																													\$ -
DC																													\$ -
				\$ -				\$ -																					\$ -
Total:				\$ -				\$ -																					\$ -
Hourly Rate																													
FY21Charges																													
FY21fun																													

[Manual and prone to human error]

CHALLENGES OF CURRENT PROCESS

- Reporting STEM metrics is very time consuming for leadership.
- Prone to human error and inconsistencies with data making it difficult to compile reports.
- Inability to 'quickly answer' questions about STEM Outreach efforts.
- STEM leadership supports with the idea of geo-enabling the metrics collection effort.



GOAL AND OBJECTIVE

To geo-enable the collection and reporting of Naval STEM metrics while providing leadership with an intuitive and interactive data visualization tool.

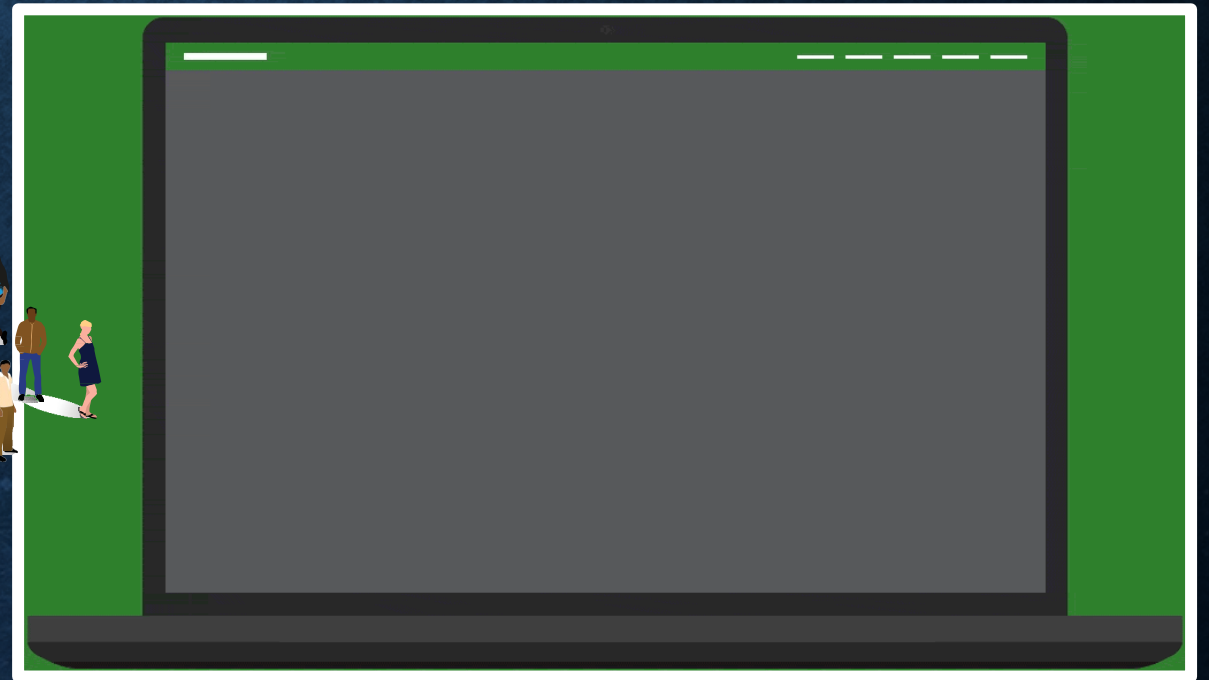
PROJECT OVERVIEW

- STEM Mapping and Reporting Tool (SMaRT)
- Provides STEM leaders the ability to collect important and consistent event metrics throughout the Naval STEM community.
- Collect STEM event data via mobile device or web browser.
- Built on the Esri platform using ArcGIS Survey123 and ArcGIS Survey Connect (SaaS) geospatial technology.
- Reports generated using ArcGIS Survey123 website.
- Operations dashboard for visualization by STEM leadership.

PROPOSED METHODOLOGY

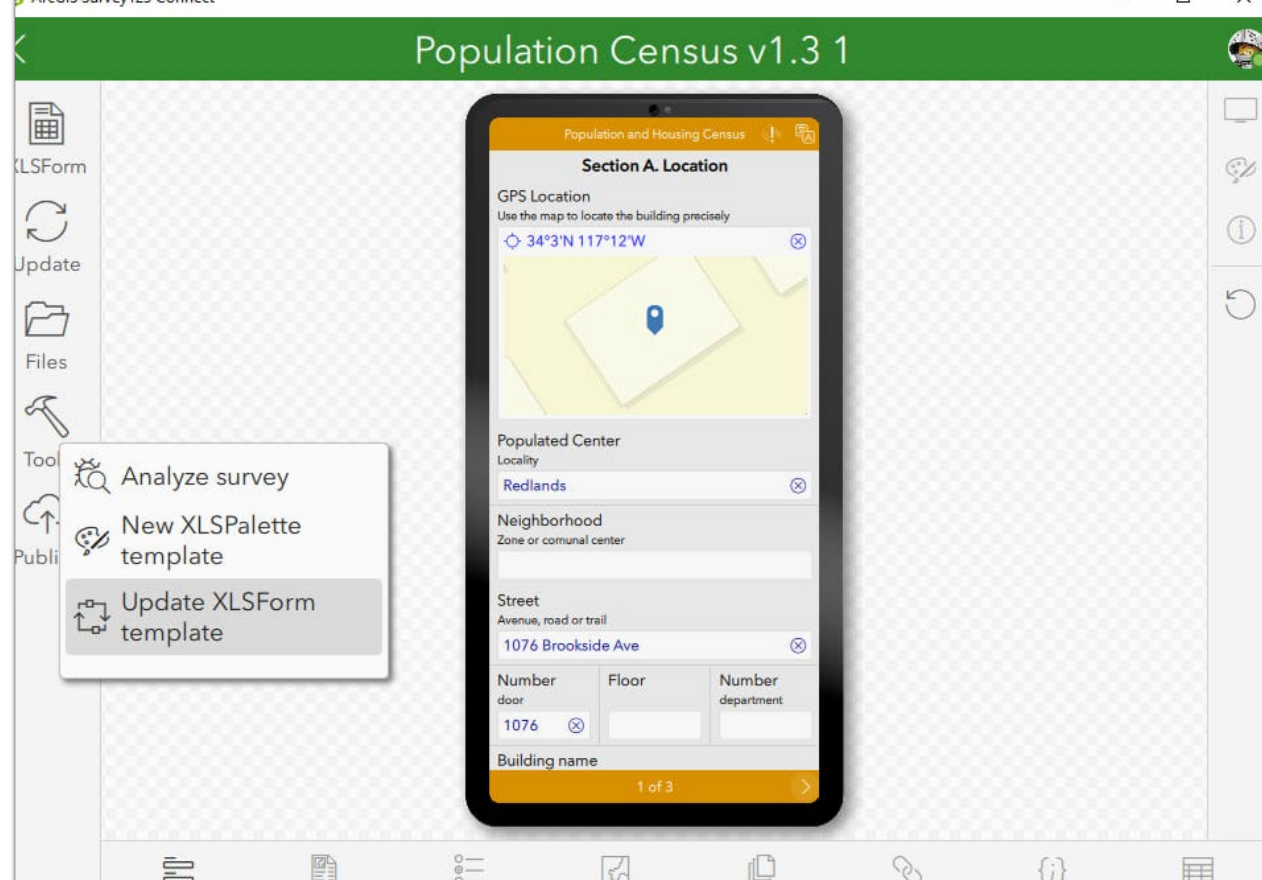
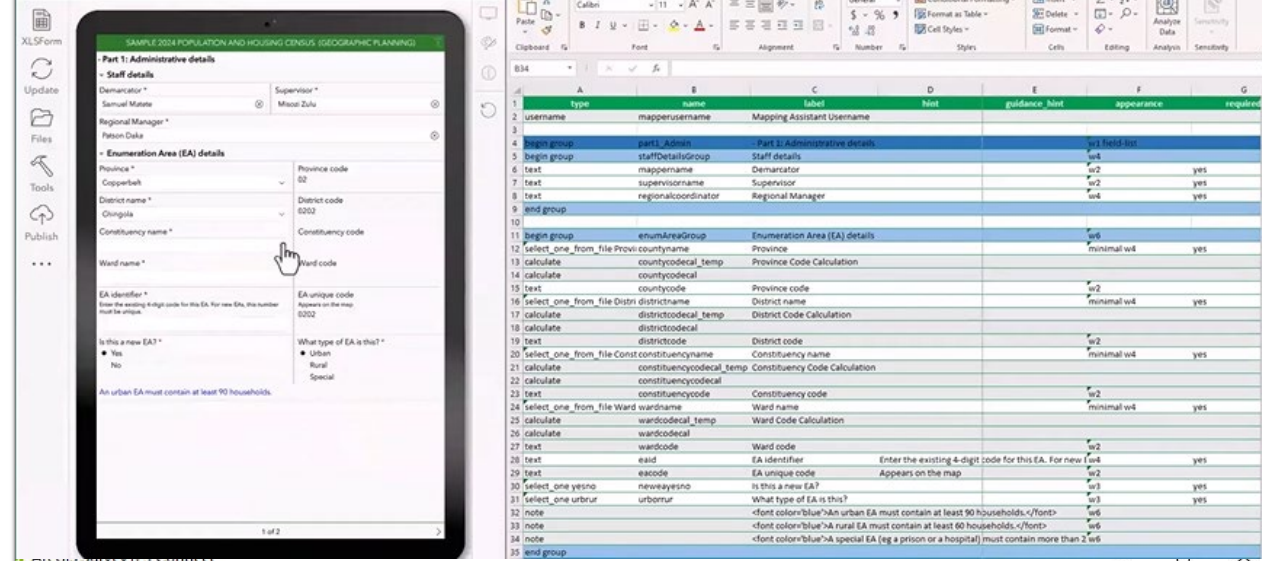
ARCGIS SURVEY123

- Capture STEM metrics, and upload data securely for further analysis.
- Data collected is immediately available within the ArcGIS platform.



SURVEY123 CONNECT

- Allows for advanced development.
- Provides full XLSForm authoring.
- Full control over the design of the survey and its behavior.
- Works from any device and supports offline data collection.



ARCGIS ONLINE

- All Survey123 items (e.g., forms, web maps, tabular reference data, survey records) are stored in ArcGIS Online.

The screenshot displays the ArcGIS Online interface. The top navigation bar includes 'Home', 'Gallery', 'Map', 'Scene', 'Notebook', 'Groups', 'Content', and 'Organization'. The user profile 'Todd Rimmel' is visible in the top right. The main content area shows a list of items under the 'Survey-SMaRT' folder. The list includes various items such as 'NIWC STEM Outreach Ops Dashboard', 'SMaRT - Survey', 'NIWC STEM Outreach Ops Dashboard Map', and 'STEM Mapping & Reporting Tool (SMaRT)'. Each item has a title, a description, a type (e.g., Dashboard, Form, Web Map), and a modified date.

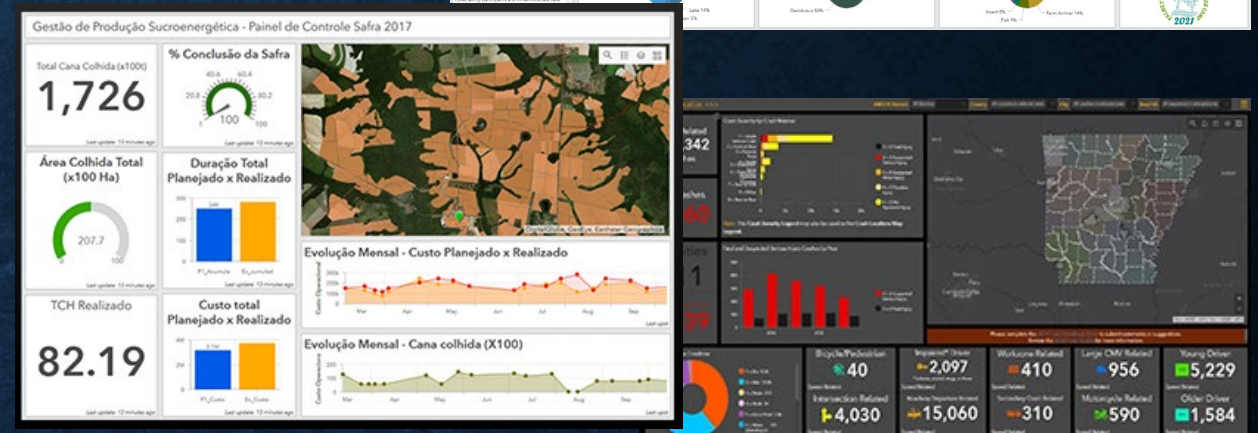
Title	Type	Modified
NIWC STEM Outreach Ops Dashboard	Dashboard	Feb 27, 2023
SMaRT - Survey	Form	Aug 30, 2022
NIWC STEM Outreach Ops Dashboard Map	Web Map	Mar 7, 2022
NIWC STEM Outreach Ops Dashboard Map 2022	Web Map	Feb 22, 2022
SMaRT - Survey_238 records_2021117000611	PDF	Nov 17, 2021
SMaRT - Survey_194 records_20210930185145	PDF	Sep 30, 2021
STEM Mapping & Reporting Tool (SMaRT)	StoryMap	Aug 26, 2021
SMaRT - Summary	Microsoft Word	Aug 26, 2021
SMaRT User Guide	PDF	Jul 27, 2021
SMaRT - Summary and Individuals.docx	Microsoft Word	Apr 6, 2021
NIWC STEM Outreach Dashboard Layer	Feature layer (hosted, view)	Jan 12, 2021

ARCGIS DASHBOARDS

- Interactive display of critical metrics such as upcoming and past events, event locations, dates, attendance totals (and more), with ability to filter by region, event type, etc.

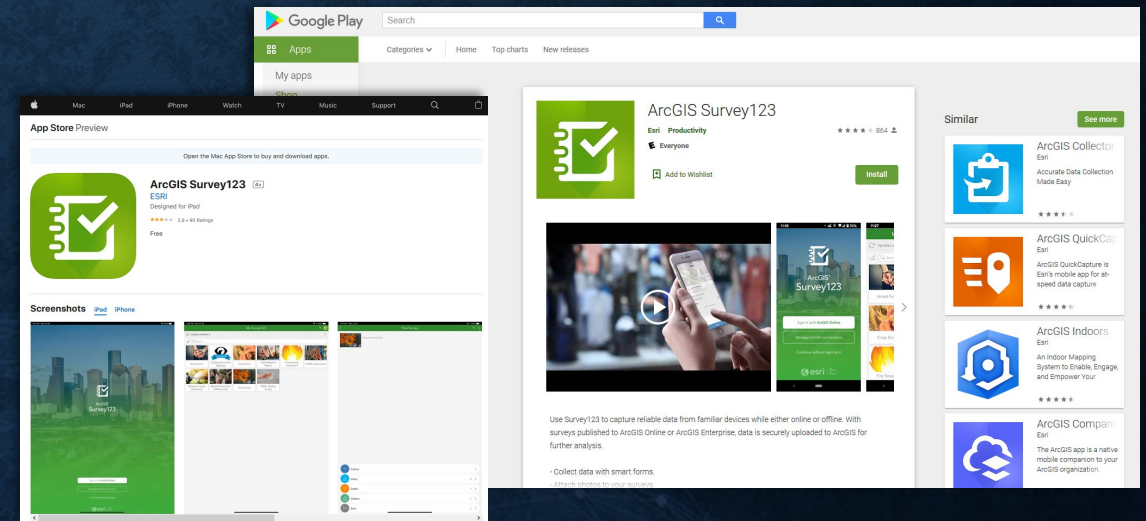
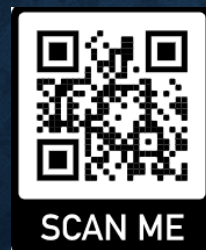


- Communicates STEM Outreach metrics to leadership in easy-to-read visual format.

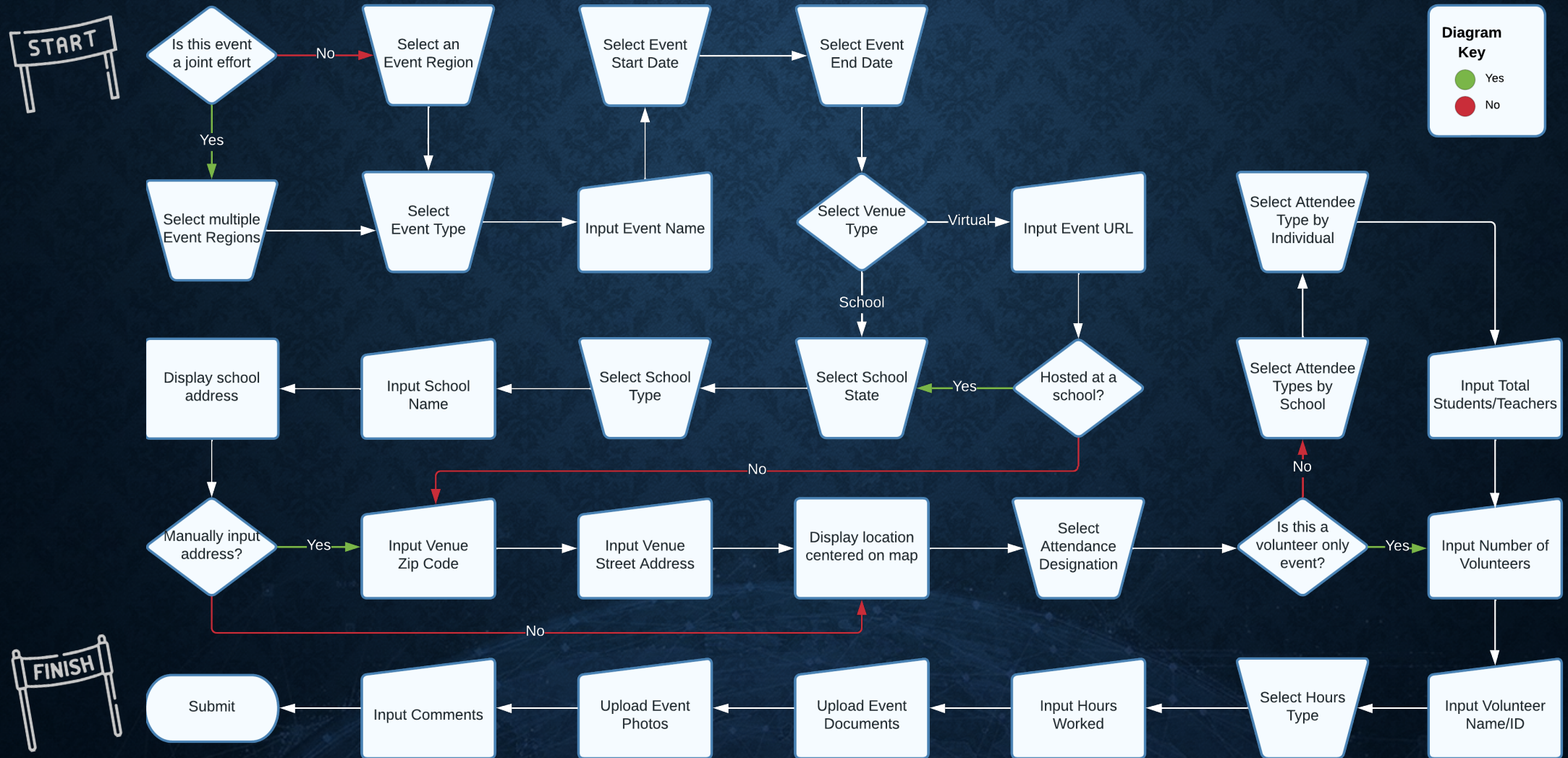


ARCGIS STORYMAPS

- Create a StoryMap with instructions on how to use SMaRT
 - How to install Survey123 app (iPhone/Android) or use the web version.
- Provide link to SMaRT Operations Dashboard (based on access).
- Embed a Survey123 form for requesting a user account.
- Include QR codes.
- Contact information.



SURVEY FLOWCHART



SOURCING DATA : OPEN DATA

 Homeland Infrastructure Foundation-Level Data (HIFLD)

[DHS.GOV](#) [DHS.GII](#) [FGDC.GOV](#) [HIFLD](#) [GEOPLATFORM](#)

HIFLD Open Data

This site provides National foundation-level geospatial data within the open public domain that can be useful to support community preparedness, resiliency, research, and more. The data is available for download as CSV, KML, Shapefile, and accessible via web services to support application development and data visualization.

For updates about HIFLD data, guidance on metadata, and known shapefile conversion issues, please access the HIFLD notifications page.

 Commercial	 Communications	 Education	 Emergency Services
 Energy	 Finance	 Food Industry	 Geonames

DATA ATTRIBUTES

Event:

Region
Type
Name
Dates
Venue Type
Location (lat/lon)
Attendance Type
Attendance Count



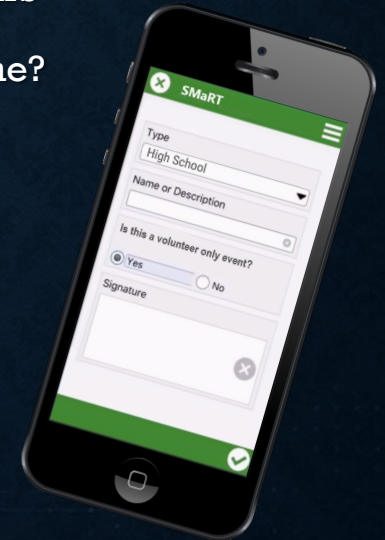
School:

Type
Name
Address
Phone
Location (lat/lon)



Volunteers:

Count
Hours
Name?



PROJECT TIMELINE

SMART TIMELINE

- **(AUG 2023):** Verify the metrics details required to be provided in the reports to ONR with STEM leadership.
- **(AUG 2023):** Review a proposed data collection workflow with STEM leadership.
- **(AUG-SEP 2023):** Develop SMaRT Survey using ArcGIS Survey123 Connect.
- **(SEP-OCT 2023):** Develop SMaRT Operations Dashboard using ArcGIS Dashboards, including design of featured web map showing event locations (and test).

SMART TIMELINE

- **(OCT 2023):** Develop SMaRT sample reports using Survey123 (and test).
- **(OCT 2023):** Develop SMaRT StoryMap with documentation and user account request functionality (Survey123).
- **(OCT 2023):** Present at NCGE – (see next slide)
- **(NOV 2023):** Soft launch SMaRT to small STEM volunteer audience.
- **(DEC 2023):** After user input and testing by leadership and other STEM leads, start collecting initial metrics.

CAPSTONE PRESENTATION

- Submitted a proposal for presenting capstone at the 2023 National Council for Geographic Education Conference held October 27-28th in Columbia, SC.

National Council for Geographic Education invites you to submit a proposal to present at the 2023 Annual Conference



2023 Annual Conference
ncge
National Council for Geographic Education
OCTOBER 27 - 29
COLUMBIA, SC
LEARN | SHARE | CONNECT

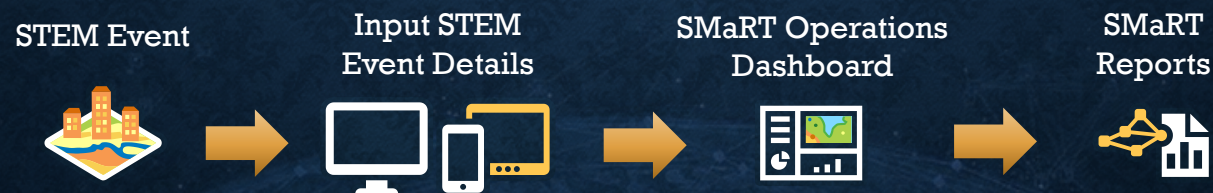
[PROPOSAL INFORMATION](#)

[REGISTRATION NOW OPEN](#)

ANTICIPATED RESULTS

WHAT WILL SMART 'LOOK LIKE'?

- SMaRT will consist of key geospatial tools combined to track, visualize and report STEM metrics.
- Web and mobile versions of Survey123 forms used for collecting STEM event details.
- Operations dashboard used to visualize upcoming and completed STEM events.
- Reports generated using filtered STEM event data.



HOW WILL IT BE TESTED?

- Past and present STEM event data will be captured using SMaRT Survey.
- SMaRT Operations Dashboard will be populated with this data.
- Data interrogation by filtering and selecting data points will allow leadership to query and QA/QC the data.
- Reports will be generated and reviewed for monthly, quarterly and annual metrics.
- STEM Outreach Leadership can compare existing manual reports with geo-enabled SMaRT output.

QUESTIONS?

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ARCGIS SURVEY123

- Esri's ArcGIS Survey123 is an easy-to-use mobile application that asks a series of questions to collect data and geospatial information using a smartphone or any other mobile device equipped with GPS.
- The Survey123 app can be designed for many types of projects, requires little training to use, works from any device, and supports offline data collection.

SCHOOLS MAPPING SOFTWARE BUNDLE

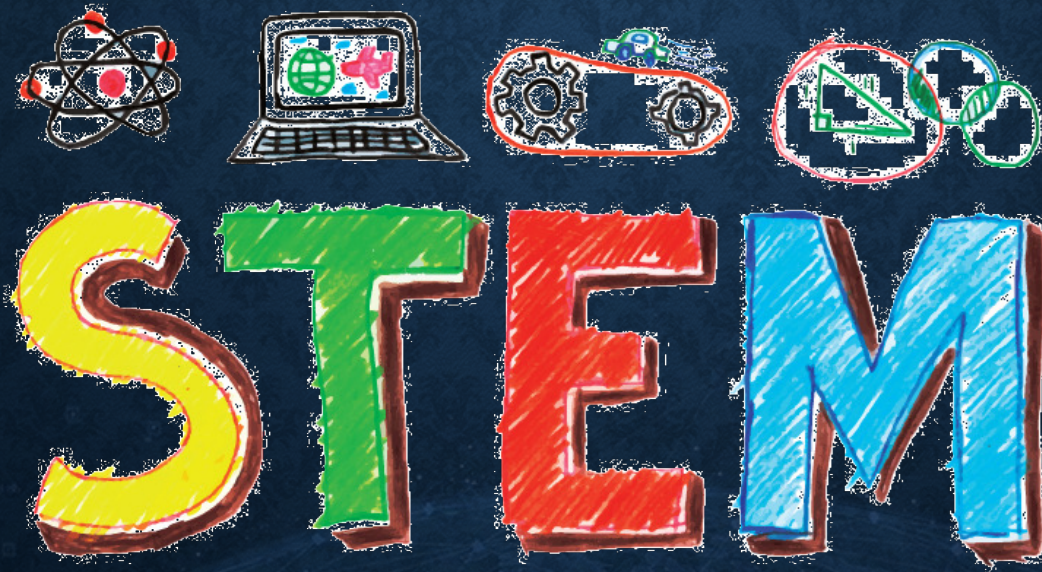
- **FREE**
- ArcGIS Online is cloud-based = no software installation necessary
- Share maps and apps with secure logins for all students and teachers.
- Ready-to-use web and mobile apps
- Robust online data analysis apps
- Visualize, analyze, create and share 2D and 3D data

<https://www.esri.com/schools>

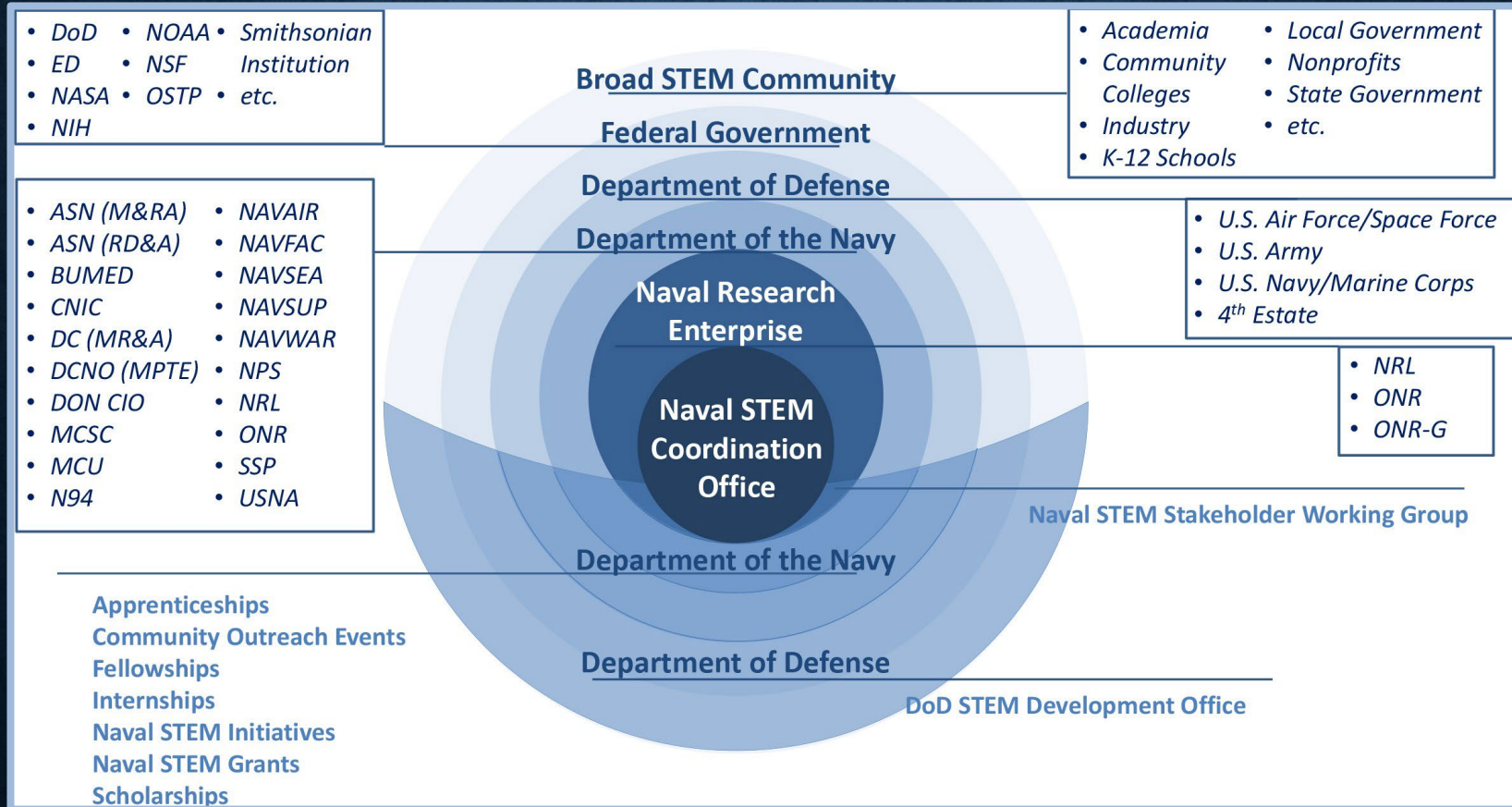
- sdfgsdfg



- asdf



NAVAL STEM ECOSYSTEM



DATA PREP USING ALTERYX DESIGNER

- Will need to blend and analyze school data in order to create school categories:
 - Elementary
 - Middle
 - High
 - Other