RECIBO OBSERVATORY
AOSA
ACE ACADEMY

ARECIBO OBSERVATORY
PUERTO RICO
SRI • UMET • USRA

LUISA F. ZAMBRANO-MARIN,ELIZABETH S
BRYAN PETTY, LINDA A. RODRIGUE
ELLEN S. HOWELL, MICHAEL C.
ARECIBO OBSERVATORY/USRA

ISDC 2015
Toronto, Canada

Luisa

Student Research
Development Center
Developing minds through research experiences
SAN JUAN 1

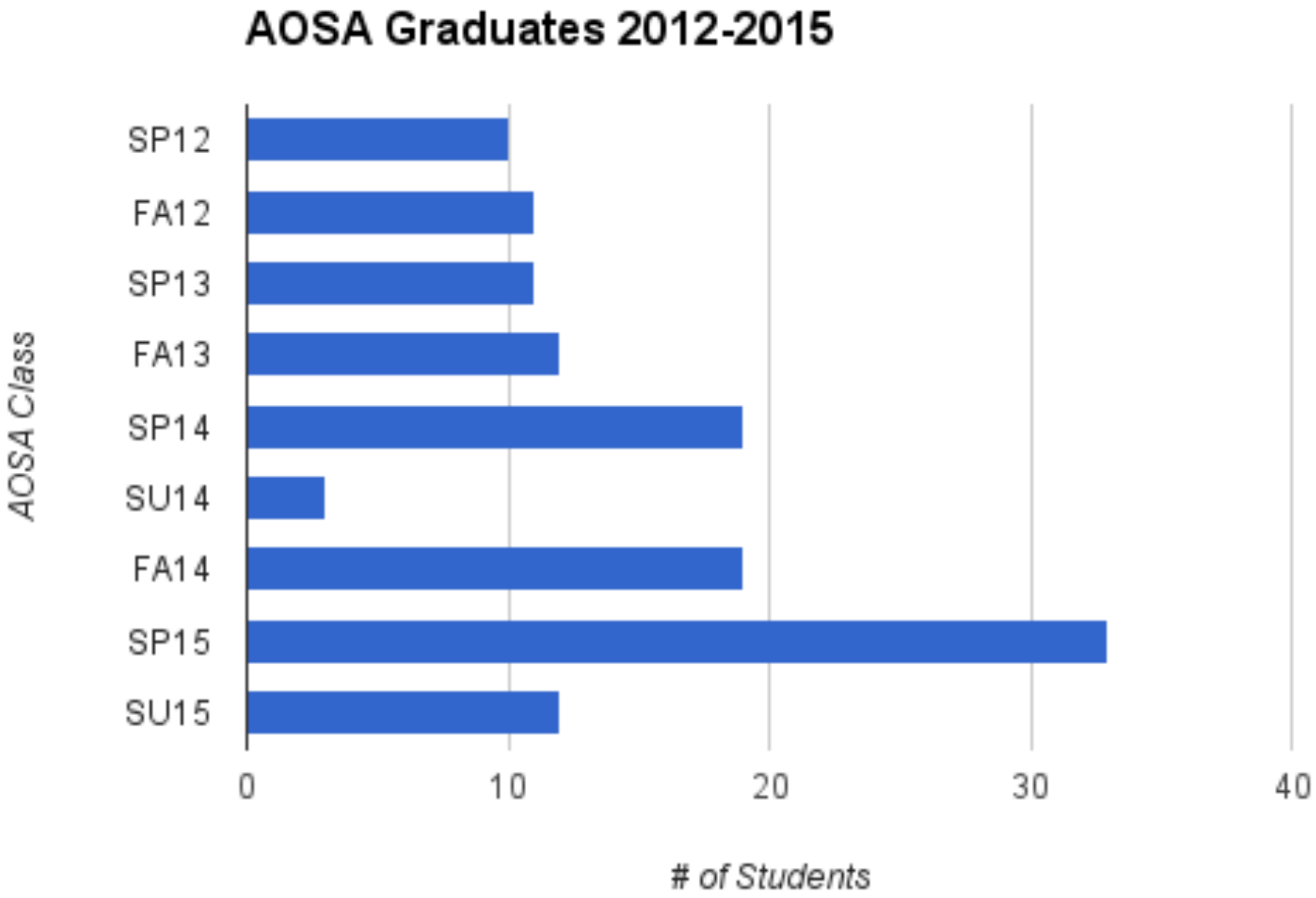
MISSION

o increase student interest in pursuing a science & space application related career, hus encouraging scientific development ssuing from Puerto Rico.

VISION

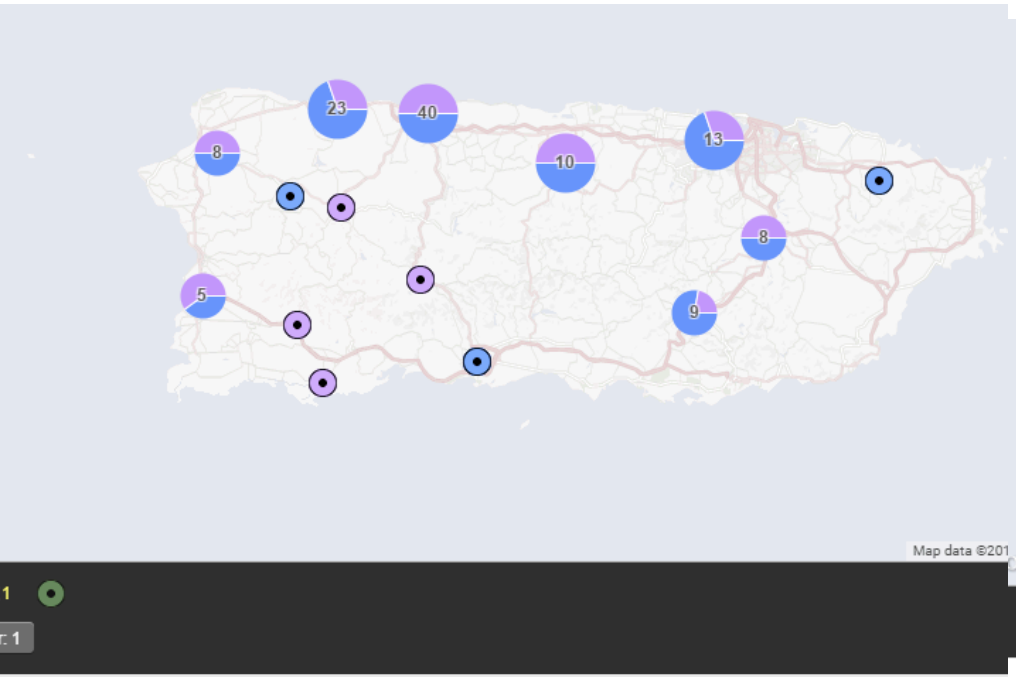
Prepare students for their **academic and professional careers** by allowing students to receive an **independent and collaborative research experience** on topics related to space and aid in their **individual academic and social development.**

To **foster** in every student an **interest in science, research, inquiry, curiosity and creativity**; expose students to various fields of **science, mathematics, arts, and space research;** encourage students to **identify problems and** produce **creative solutions** by applying the scientific method and **synthesizing known information.**


AOSA Graduates 2012-2015
AOSA Class
SP12
FA12
SP13
FA13
SP14
SU14
FA14
SP15
SU15
0
10
20
30
40
# of Students

OGRAPHICS

Grade and Age of AOSA participants, 2012-2015
Age
Grade
18
15,5
13
10,5
8
Grade
Age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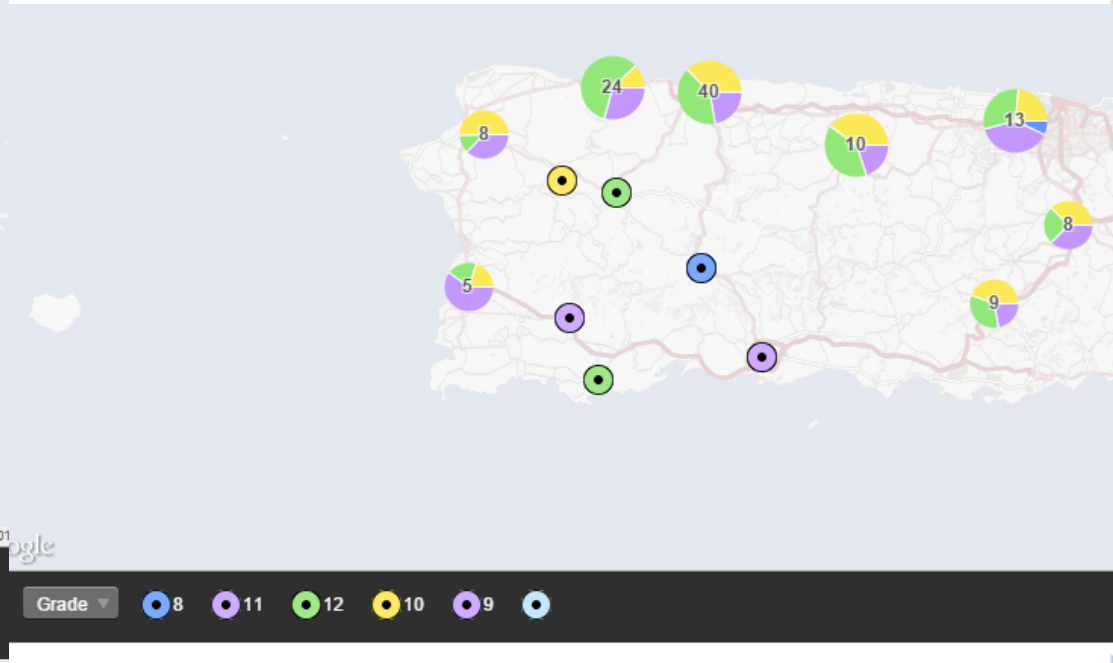
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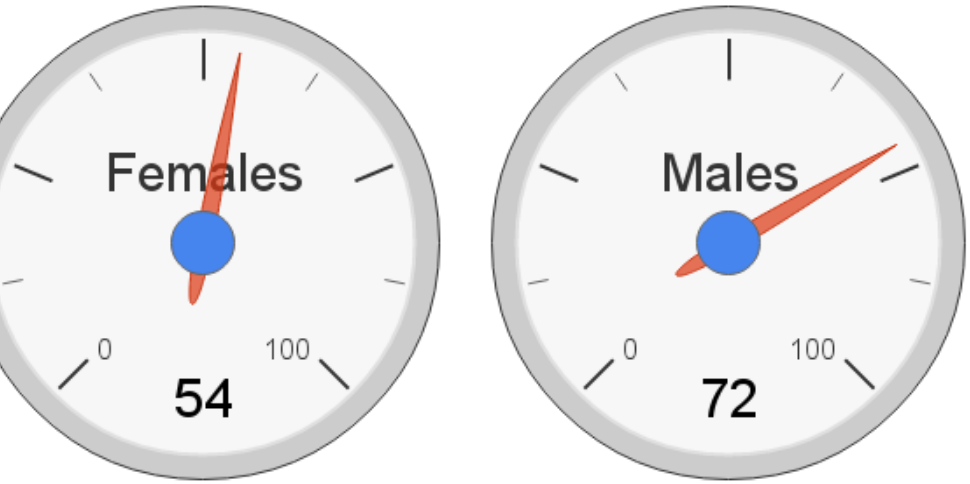
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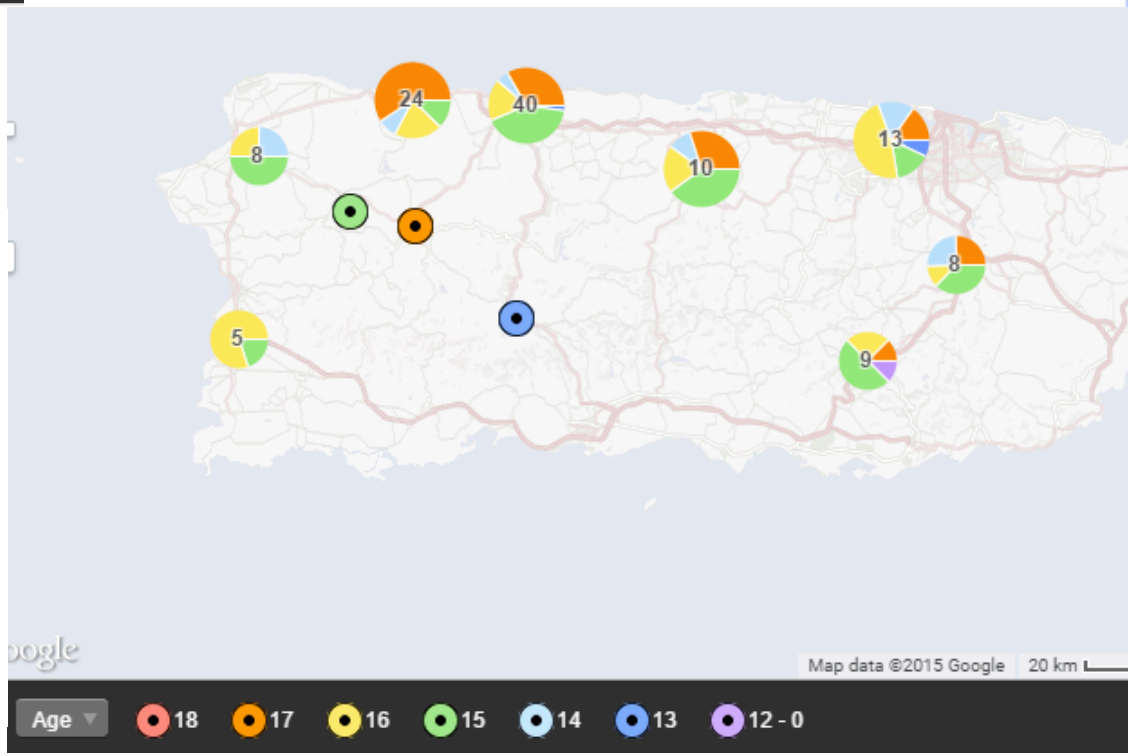
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National Space Society

ISDC 2015

Student Research
Development Center

BORN AFTER APOLLO

National Space Society

ISDC 2015

Student Research
Development Center

Skills :

dership & Teamwork
ck thinking
lic Speaking
aborative Writing
p Search and site
ation

Concepts:

- Units of Measurement
- Graphs, tables, charts and data representation
- Problem solving strategies
- Cyber security protocols

Scientific Research

- Methodologies,
- Significance of literature review
- Reference Systems

ETHODS. The AOSA pre-college program applies multiple instructional thods for students to expand their skills and knowledge. Being part of a **entific environment immersion** helps to promote student ingenuity. Students are posed to a **variety of the teaching methodologies**, including:

- **Instruction methodologies**
  - **Inquiry based learning**
  - **Peer Instruction**
  - **Constructivistic learning**
  - **Team work**

- **Activities:**
  - **Field Work**
  - **Lectures**
  - **Discussions**
  - **Experiments**

LECTURING: oral communication, usually with
he aid of visual enhancements, such
as powerpoint, videos, and white board.

COLLABORATIVE TEACHING:

students to become engaged in he learning process by **sharing deas and debating** positions; assists students in establishing a **personal connection** among heir peers bringing together their opic, ability to work as a eam, communication and eadership skills.

DEMONSTRATIONS

Uses examples
and experiments, this is
a preferred technique, to
reinforce memory
retention by linking
scientific facts with real–
world applications.

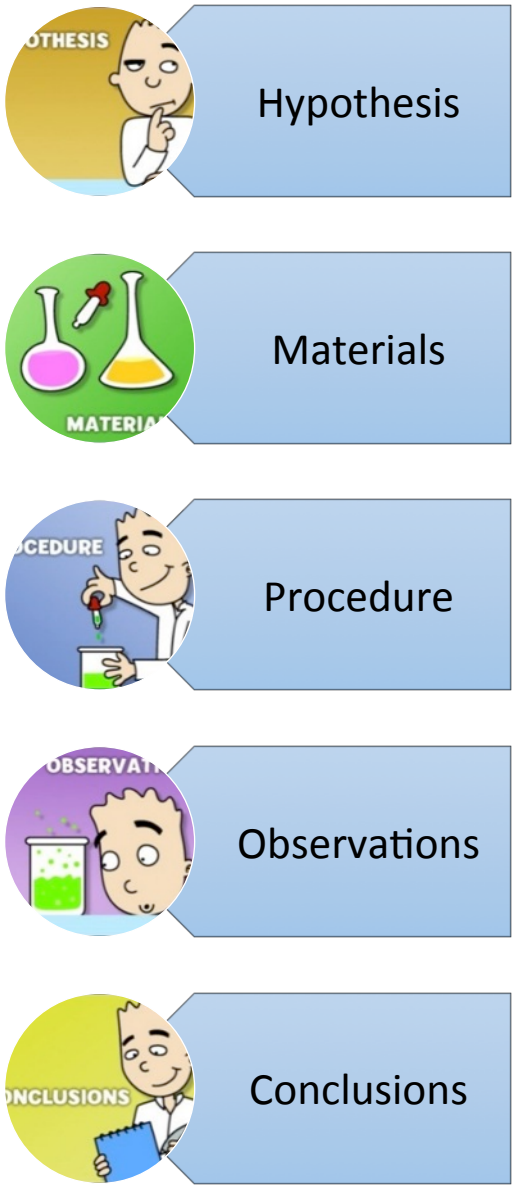
TEACHING

Using role switching, students assume the role of the instructor and teach their topics to their peers. Students exposed to this teaching methodology tend to increase their self-confidence, leadership, and ESL skills.

EVALUATION RUBRICS

- PEER INTERACTION
- PREPARATION
- PARTICIPATION
- CONTRIBUTION TO CLASS
- GROUP DYNAMICS
- ATTITUDE
- CHALLENGES
- INQUIRY
- JOURNAL

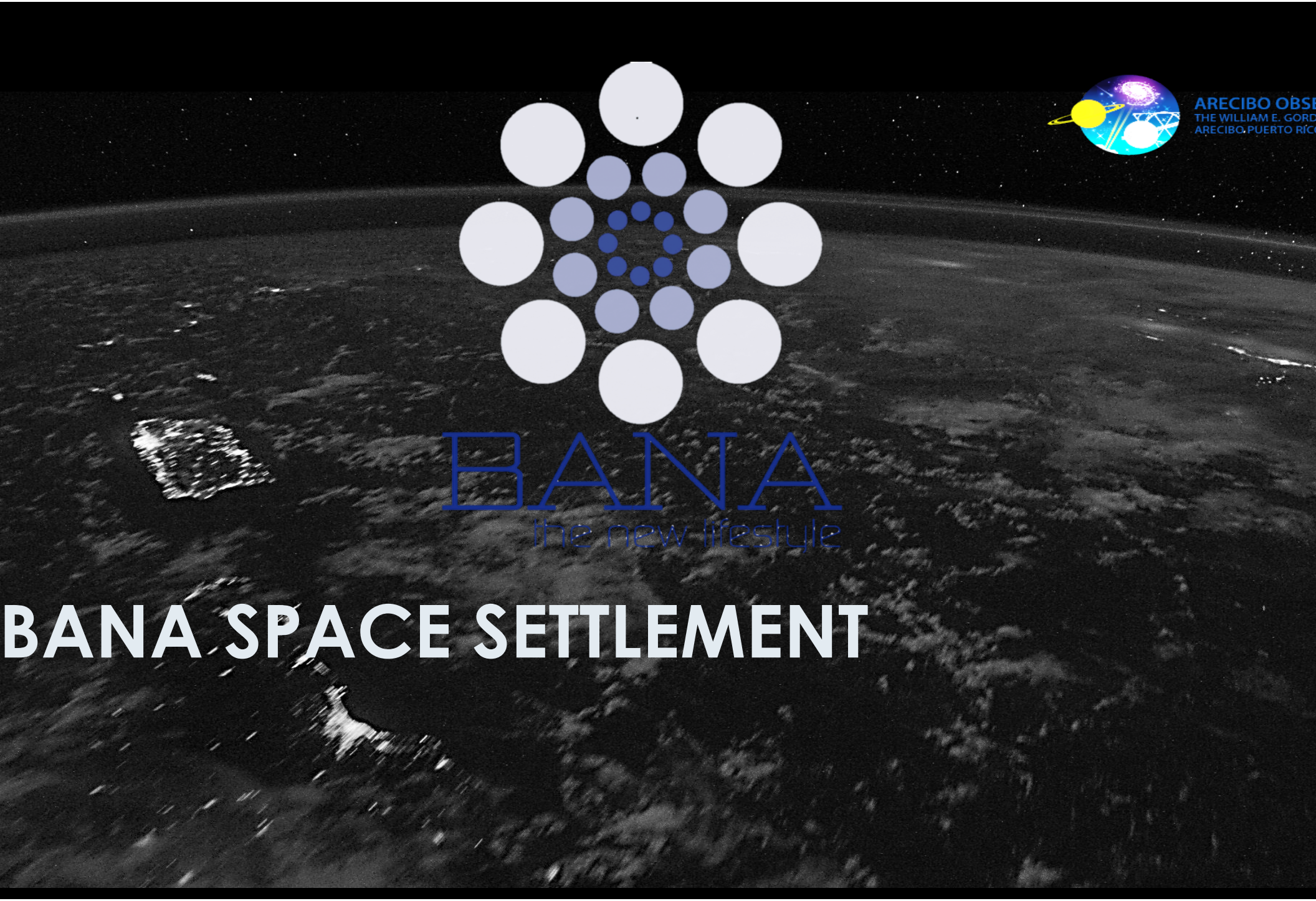
SCIENTIFIC METHOD



PROGRAM ACTIVITIES

NTRO LESSON SAMPLE

ARECIBO OBSE
THE WILLIAM E. GORD
ARECIBO, PUERTO RÍC
ARECIBO OBSERVATORY SPACE ACADEMY
WELCOME !



BANA SPACE SETTLEMENT

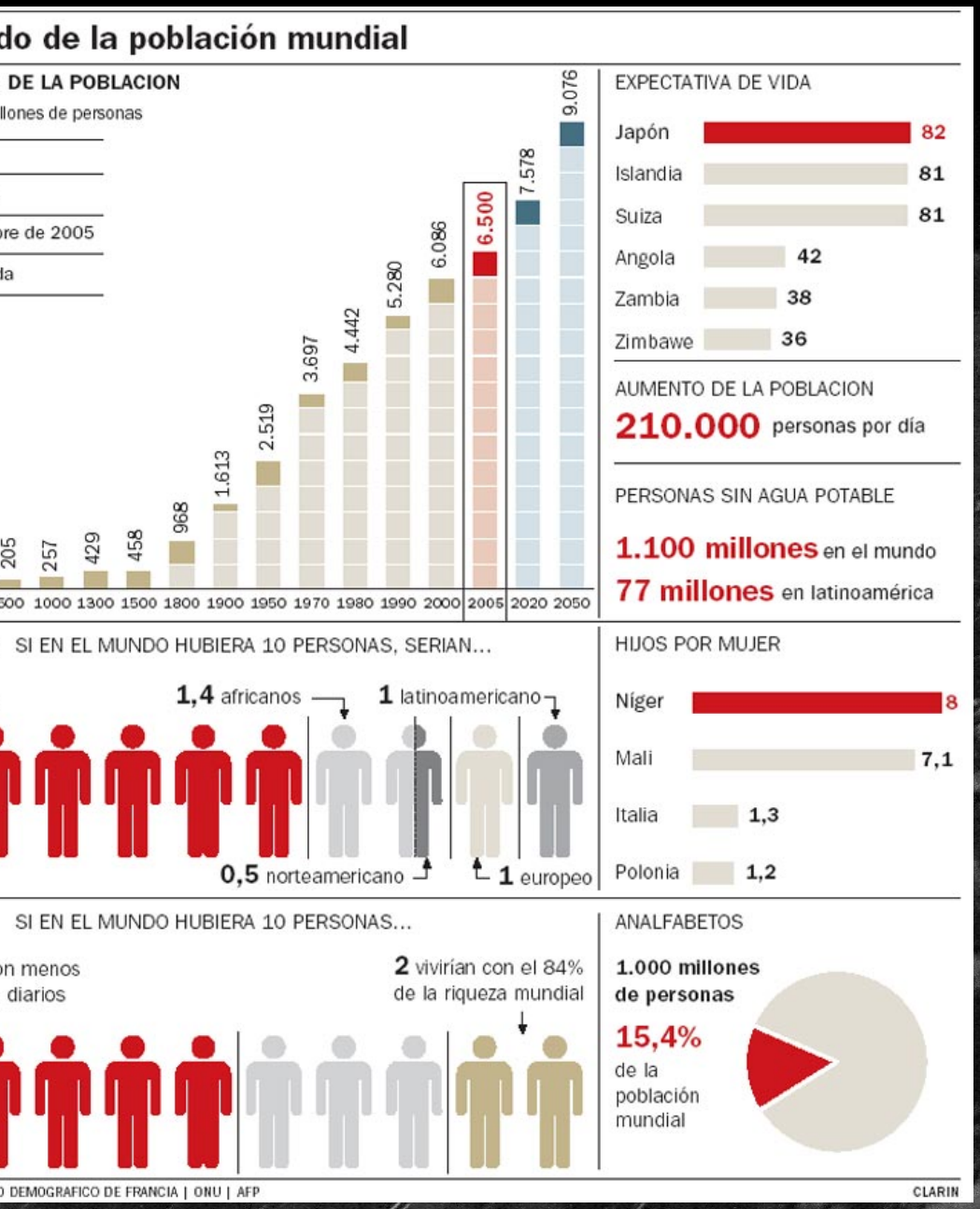
SS-NASA Ames Space Settlement Design Contest

ARECIBO OBSE
THE WILLIAM E. GORD
ARECIBO, PUERTO RÍC

- Design an orbital Space Settlement in free space
- Designs, original research, essays, stories, models, artwork or any other orbital space settlement related materials may be submitted.

BANA

- BANA1.0: for 900 people in lagrange point 2.
  - The team won 3rd place in 12th and 11th grade and honorable mention in literature.
- BANA 2.0: for 300 people, in L2
  - The team won first prize In 11th grade, and 12th grade. Literature Honorable mention
- BANA 3.0: for 100 people, in L1
  - The team wo honorable mention for 12th grade



Fields of study

- Math
- Physics
- Chemistry
- Engineering
- Material Sciences
- Environmental sciences
- ESL
- Space Sciences

What is Science?

Uses methodology, instructs order, sequence, and structure

Lots to discover! We've been from Caves to Space.!

- To preserve our species.

New Discoveries

- Mind uploading, Qualcom tricoder, Big Data, información Access

PROGRAM ACTIVITIES

BIRD EYE VIEW OF WEEK 00-10

WITH PICTURES!

DELIVERABLE(S)=168

10 PPT(S)=10

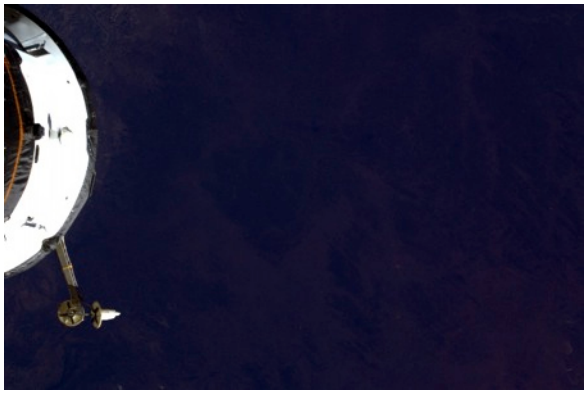
REPORT(S)=8

JOURNAL=1

RESEARCH=1

Wk00

- Mission #1- Pre Eval
- Mission #2 EarthKam
- Bring Journal
- Read BANA



Cyber Security Activity: Read email from Mission#3; Complete activity
5 ppt, (team): Create a 5 slide presentation with your research topic/idea to present to your team. [there can be one or more
resenters, but only 5 slides in less than 5 minutes!] Please upload Presentation to designated folder

mergency Plan V1.0: Prepare an emergency plan for _[Place]__ in case of __[Emergency scenario]

Units: Galactic Address: Complete the activity, upload to your folder.
ticky Wall Data Tabulation: Tabulate the data from the sticky wall into one excel sheet to be shared with your team and the faculty. [One
abulation per group] Place the sheet on the folder that belongs to your research area here.
esearch & Personal Website: Using Google Sites, create a website for your Research Project
lant Log: Plant a seed and keep a log in your journal of the plant from the moment is planted on. If your seed doesn't germinate within
4 days please plant another one and keep a log. (planting more than one seed is highly encouraged)
elect 60 second video: Use this list to select the video you want to work on. You might have to work in groups if the video you choose has
lready been selected by another candidate. The 60 second presentation can be given in any form of oral and visual representations
ppt, prezi, video, song, drama, monologue, poem...etc..]
ntelligence Test: visit this link and complete the intelligence test. Place results on your journal.
ournal: Update journal with specific specifications specified on the welcome pack.
ournal Cover: Make a cover for your journal, its a form of free artistic expression.
ood Order : Complete the following food Survey.
isit the links Posted on the Deliverables site.
Age in other planets
units/Vocabulary
Student Research Plan
Sign the sign in sheet
Bring badge
og into email
ead welcome deck
ndividual) and a Personal Website

WK01

o react during an emergency" talk

s be honest, not everyone can keep calm during an emergency such as an earthquake. ot students that are already stressed and anxious on a daily basis due to the l amount of school work and tests that CROEM gives (not that anyone's g). During my three-year stay at CROEM, not once have there been an "How to react mergency" talk or workshop.

as part of my emergency plan, it is absolutely primordial that at the start of every ere's the compulsory "How to react during an emergency" talk. The most important it should cover is how to keep your marbles during that emergency, and that if you e that is obviously not keeping their marbles then you as a responsible human being nd help them by looping an arm under their armpits and getting them to move. The also cover the protocol for each event and how to react quickly, since in CROEM inging bell system or anything that could announce what type of emergency is It's all down to you and the teacher.

protocol for an event like an earthquake for CROEM should be:

ing the earthquake, get under any surface available. If you are on a place with tables, under the table. If you are outside, go to an area where there aren't any trees— don't o contact anyone yet, since everyone will be panicking or busy looking for cover. r the earthquake, get out of under the surface and locate the teacher or figure of ority and follow their instructions. If you are on your room, get out to the hallway get to the nearest group of students and start making a line to the nearest exit. efully, there's a figure of authority on their way, or with you. If you are alone, you contact someone right now and try to go to the nearest group with teachers.

•This is where the steps stop for the people down in Agricultural Sciences. Once are back into reacting in time, the teacher or anyone will contact the director. The e signal is bad in this area, so the teacher or someone has to set up the radio from the rgency backpack. The teacher should also go around making sure every student is

EMERGENCY PLAN FOR THE FAMILY

The benefits of having an Emergency Plan are:

- Less people get lost or injured if they have specific instructions on what they should do.
- It also accelerates the resumption of normal operations.

House Adress:

Montebello Estates, Calle 2 D 2, Trujillo Alto, P.R. 00976

Information of the residents of the household.

(Adult) Nyvia Milian (787) 413-1758

Height: 5'00

Hair color: Brown

Eye color: Brown

(Minor) Daniela Marin (787) 344-3375

Height: 5'5

Hair color: Brown

Eye color: Brown Hazel

Pet information:

Betta fish

Name: Tito

WK02

Galactic Address- uploaded to folder
Binary numbers activity -uploaded to folder
Research Proposal Due - on folder
Reflective Paragraph

Research Guideline Questions - Worksheet provided

Complete Materials Request form - Form provided. Upload to folder
Plant log
Journal Improvements
Team Abstract- Worksheet provided
ESL Worksheet
Anything else your faculty mentioned.
-read links on Deliverables feed
-update Websites
-Water consumed in one day by you

AOSA SP15
STUDENT RESEARCH PLAN
NAME: _____ DATE: _____

LITERATURE REVIEW

KEY QUESTIONS	WHO DID WHAT WHEN	REFERENCES

WK03

1. **Create an info-graphic about Space Exploration Spin Off Technologies Or Research Project and save it in the Infographics Folder. With your name and V1.0**

Update your Personal and Research Team Website- this is tracked by google analytics, so we just look at that data.

Host a google Hangout with your research team and discuss the procedure you will practice on Week 03-

"Review your emergency plan and create a Version 2.0 (V2.0) of your lesson plan. Make sure to upload it to the Emergency Plan Folder. And Name the file LastFirstNameEmergencyPlanV2.0"

Play The Spin off technologies game found on nasa.gov

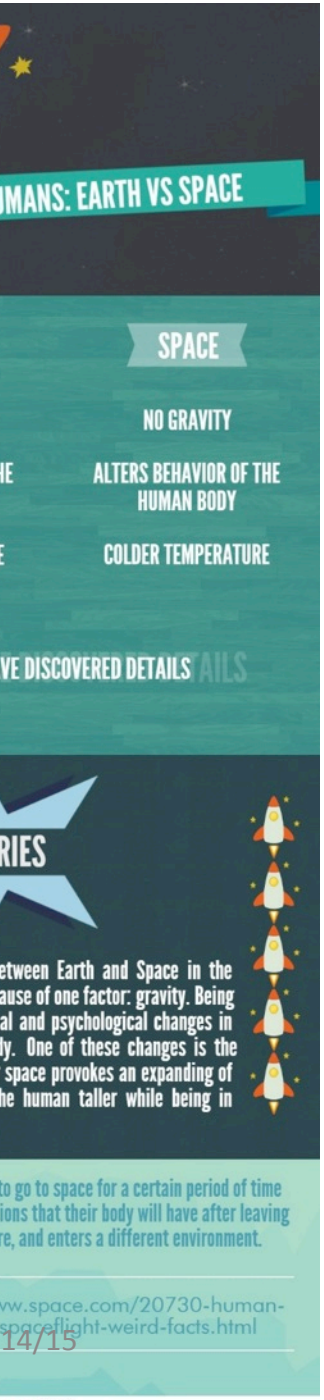
Use the worksheet in the README folder, named PROCEDURE WORKSHEET to transcribe your procedure and use it to test the procedure during Week03. 2. It is also recommended you read information from Harvard University regarding methodologies of scientific research. 3. In Preparation for this activity we encourage you to practice the following procedure with friends or family members: MythBuster's Practice Makes Perfection"

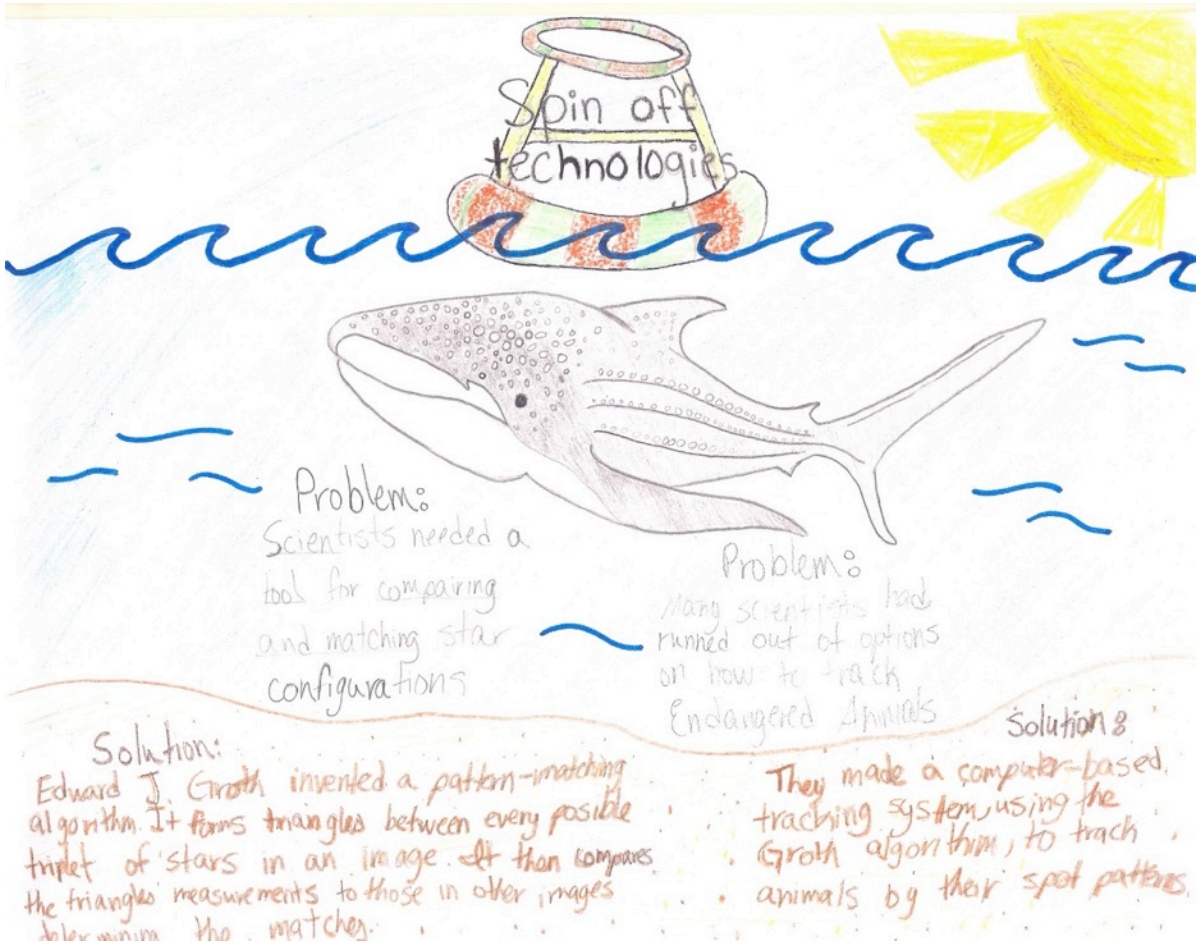
Read The Mars One Mission Paper found on the README folder

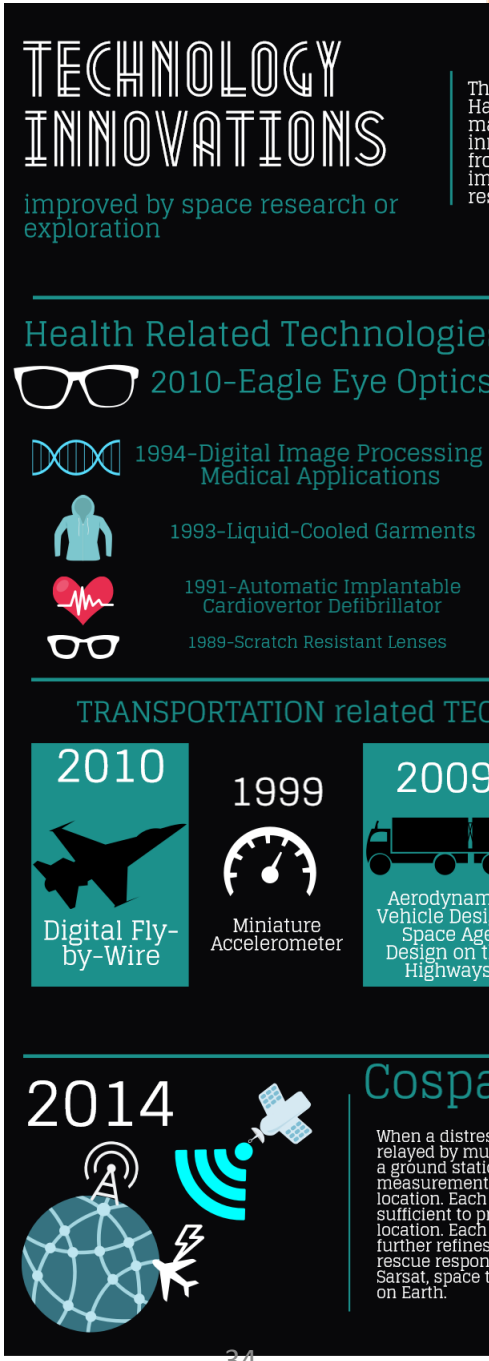
Watch 5 signs of life on Mars

Bring Sport Clothes and closed toe shoes(tennis preferred)

10. Plant Log-Digital
11. Plant Log-Journal


MANS: EARTH VS SPACE
SPACE
NO GRAVITY
ALTERS BEHAVIOR OF THE HUMAN BODY
COLDER TEMPERATURE
VE DISCOVERED DETAILS
RIES
etween Earth and Space in the ause of one factor: gravity. Being al and psychological changes in ly. One of these changes is the space provokes an expanding of he human taller while being in
to go to space for a certain period of time ions that their body will have after leaving re, and enters a different environment.
w.space.com/20730-human-spaceflight-weird-facts.html


Spin off technologies
Problem:
Scientists needed a tool for comparing and matching star configurations
Solution:
Edward J. Groth invented a pattern-matching algorithm. It forms triangles between every posible triplet of stars in an image. It then compares the triangles measurements to those in other images
Problem:
Many scientists had runned out of options on how to track Endangered Animals
Solution:
They made a computer-based tracking system, using the Groth algorithm, to track animals by their spot patterns.


TECHNOLOGY INNOVATIONS
improved by space research or exploration
Health Related Technologie
2010-Eagle Eye Optics
1994-Digital Image Processing Medical Applications
1993-Liquid-Cooled Garments
1991-Automatic Implantable Cardiovertor Defibrillator
1989-Scratch Resistant Lenses
TRANSPORTATION related TEC
2010
Digital Fly-by-Wire
1999
Miniature Accelerometer
2009
2014
Cospa
When a distres relayed by mu a ground stati measurement location. Each sufficient to p location. Each further refines rescue respon Sarsat, space t on Earth.
powered by Piktochart

WK04

Upload to your folder the Final purchase order

Report WK 03- Create a report from your procedure and data collection simulation from Week 03, upload to your folder

Peer evaluation (Complete the peer evaluation form)

Simulation data (Create graphs, tables, diagrams and/or figures to portray your simulated data)

Bring sports clothes (and a change of clothes)

Ancient models of the world (READ and do, store in your folder)

Create an Infographic 2.0 of the spin-off technologies, name it and store it with same format as V1.0 and in same place.

Collect recyclable materials at home, catalogue them, make observations, clean them and bring them on Week 05 meeting.

Complete the Microeconomics questions found on the READ ME folder

Website review [sent by email]

LASS OF SPRING 2015

dering:
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Luisa doing
ning day!

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is quite
have
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academy.

I really don't have much to compare it to but, this academy is really one of the best things that has happened to me this year. I have learned so much during this spring, and I have done more work than I thought possible.

My experience in the Arecibo Observatory Space Academy (AOSA) has been tremendous. I joined the biology group and since then my interest in many biology fields has intensified.

The opportunity to expand your knowledge in the best possible way about the things that absolutely fascinate you is huge.

AOSA does not only expand your 'intelligence' or 'logic', it also helps you grow as a person by:

- Accepting criticism
- Learning to work on groups with people you don't really know.
- Knowing how to present yourself
- Working hard
- Finding ways to solve daily and complicated situations/problems
- Investigate/Research
- Adjusting to changes

I have learned these things either by myself or by force and it has helped me greatly on AOSA and at school.

I am extremely grateful for the opportunity given to me on this academy. I have made good friends, great memories and a ton of work. In conclusion, this academy has brought an avalanche of good things for me. Plus, it helped me realize that it is never too soon to start doing what you love.

By: Loreilys Mejías Rivera

WK06

- Arecibo Message
- Physics of rocket race
- Peer evaluation
- Plant log Report Skeleton
- Research Report Skeleton
- **AOSA Newsletter**
- Teacher Invitation
- Emergency plan V3.0
- Recyclable Materials from school
- Submarine 411
- Cosmic Communication
- Moon Habitat
- Space Shuttle

ly Galactic Adventure

xandra Rigau Lausell

tarted on January
ust 3 days before
plication form
ine. One of my
s told me about
ecibo Observatory
Academy (AOSA)
new I had to tell
about the pro-
At first mom said
eing that the pro-
was in Arecibo and
etty far from
I live, but after a
onvincing from my

Picture taken by: Sandra Lavell, on: February, 2015

Mom said yes. And I started looking for the required documents, and I sent then just
e the deadline. Now I had to wait until they told everyone who could go to the group
iew. But in the meantime I did the earthkam mission which I found really cool, and I
appy with the results of my photos. After being invited to the group interview, I went
e first time to the Arecibo Observatory. That day I met Luisa Fernanda (the AOSA
or) and all the mentors. They explained the different groups which we could join and
they told us we had to talk to the mentors. I joined a group who was talking with
rnke and the group exchanged ideas and we discussed different themes.

After the group interview, we had to wait until they said who the chosen candidates were. After a week I received an email saying that I was chosen. My whole family was happy and I couldn't wait for our first Meeting. On week 00 we were 60 candidates. We got separated into groups and I chose the PSCR team because I had talked with Dr.Strenke on the group meeting. The PSCR team was really small compared to the other groups. We discussed the different topics for our research and we made a Sticky wall with all of our ideas. On week 01 we had our first core lecture, it was about cyber bullying. They checked our journals for the first time and I was really nervous about it. On week 03 we went down to the radio telescope, I was so excites because I had never seen it. Plus that week we were having another cut off. The PSCR Team was already small enough and I was afraid they would cut off at least half of it. So when on week 04 I saw that the group remained the same I was really happy. On week 04 we had our "Astronaut Training". It has been one of most exhausting days ever. Not even half of the PSCR team made it all the way to the end. But I did finish it, and it made me feel proud of myself. The rest of the weeks have passed in a blur. I can't believe how quickly time has passed. The PSCR team feels like a family and it's really easy and fun to work with them. Over time we've also interacted with other Cadets of the academy and I have made great friends in the academy. The academy has been a wonderful experience in which I've had the opportunity to learn more about space. The academy also teaches you values such as: responsibility, team work, solidarity and honesty.

The Psycho-Socio-Cultural Research (PSCR) Group is a team of cadets whose goal is to research and analyze the socio-cultural implications of space travel in colonization, physiological and psychological effects of space travel, ethics of space and space travels and the implications of off-Earth.

I'm glad I could join the Spring Class of 2015

Administrator, Writer, Columnist and editor: Alexandra Rigau Lausell
Contact Information: alexandrarl@aosa.naic.edu (787)552-3191

w to get Rid of Boring Weekends

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Arecibo
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(PSCR). Each of
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ent Research Possibilities

ysics

uisa Fernanda

ght suspect, physics in space are different than here on earth, as there are
ables to take into account. This field focuses on the study of anything that has the words physics and space in the same sentence. Luisa is in every other research group, as she is the directress of the program. Also, she speaks spanish and english.

Engineering Staff: Jose Molina	Biology Staff: Bryan Petty
This group will investigate technology and try to improve it, the true meaning of engineering. The list of topics that are encountered on this field is nigh endless. Jose speaks spanish and english as well.	The Biology group will tackle anything that is alive, from bacteria to trees. Having a radio telescope near, some of the students in this group choose to study the effects of radiation in living beings. Bryan can understand some spanish, but barely speaks it,this means he has english as his First Language

PSCR (Psycho Socio Cultural Research)

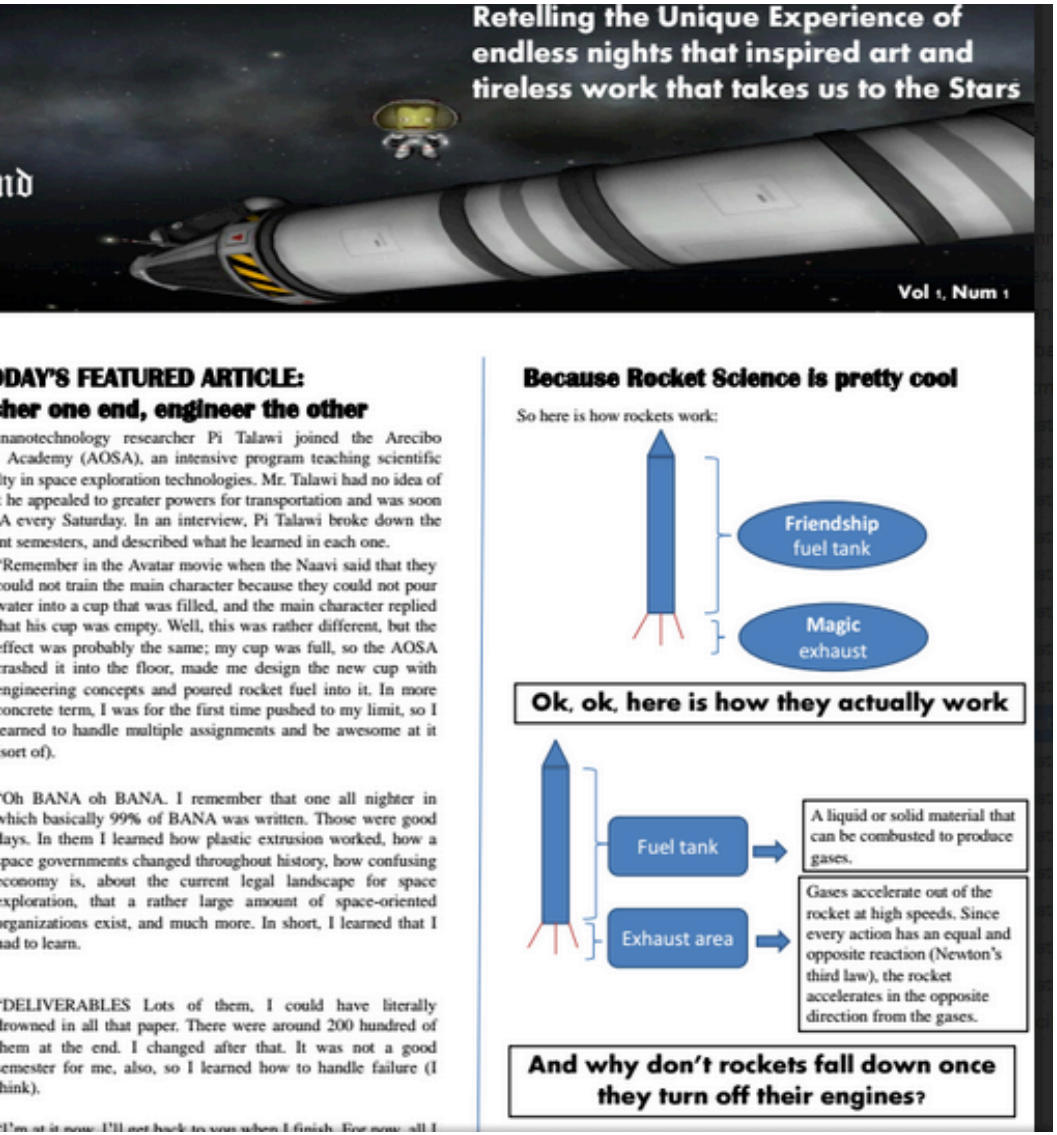
Staff: Elizabeth Stirnke

This group is the closest thing to psychology in AOSA. They study the human mind, for example: society, culture, politics, ethics, etc. Elizabeth (Liz) speaks english as her first language and is learning to speak spanish and understands it fairly well.

The Outcome

When the research is ready, or the given 10 weeks of research are over, there will be an event, to which the press, the student's parents and others will be assisting, that will consist of presenting your research, results and conclusions. After this, a graduation will be held for the remaining cadets.

-Kelvin Milian Santiago



Arecibo Observatory Space Academy

By Alanis Y. Rosa

ARECIBO OBSERVATORY
THE WILLIAM E. GORDON TELESCOPE
ARECIBO PUERTO RICO

AOSA has taught me...

This program has taught me many things. Some are very different from one another while others are similar. We also repeat many of the deliverables so we can learn and make them better. Practice makes perfect! The lectures we get every morning are very interesting. My favorite lecture was "Water in Our Solar System." This lecture was given by Dr. Ed Rivera. Dr. Ed Rivera is the first Arecibeño to work at the Arecibo Observatory. The deliverables that we have to do for every Saturday are very interesting. Some of the deliverables are hard but I like learning this new things. After the lectures we divide into our respective groups. My mentor, Dr. Bryan Petty, gives us small lectures about different things in biology. The lectures he has given us are of: basic biology, genetics and radiation, and microbiology and pathology. These lectures are very interesting. In these lectures I learnt about the tree of life. The tree of life is very big and consists of Eukaryotes, Bacteria, and Archaea. The tree of life has all of the organisms that scientists know. The interesting thing about the tree of life is that plants and animals take a very little part of it. They have also taught me about public speaking of what and what not to do,

Personal Opinion

I think that AOSA is a great program. I have learned so many new things and have interacted with great people. The people I have interacted with are great because they share my passion for learning new things. This is a great program, which I am very glad that I am apart of. The staff members are very helpful and great. They really do want to teach and help us.

AOSA SP-15

bo Observatory Space Academy

t of the Arecibo Observatory Space
r as we call it, AOSA, has been an
xperience. From almost having a
eakdown to actually having one
story of how my life changed in just
ıs.

tarted on February 7th 2015. This
volves science, technology, and
gs. We divide in to three groups
, Biology, and Psycho-social-
e get loads of homework for a set
call them deliverables, these
s force you to read, analyze,
gine, and lots of other things. The
SA encourage you to do everything
n way, at the same time following
cifications that may seem as if they
daries, but they just make you
rspective. They give us loads of
e how we will cope and if we can
d not give up.

onths ago my mom found out, via
about this program called AOSA.
knows that I want to be a
engineer she told me about it,
ved and how could I sign up. When
the website it said that I needed to
word essay about why I wanted to
e program. In this essay I chose to
my story since the day I decided to
nical engineer. Apparently the staff
use they sent me an e-mail saying
next step I needed to complete a
o I completed the mission and
e-mail that said that I was invited

The day came when I had to wake up early to go to the assembly. When mom and I got there, there where many other families there waiting for it to start. When it started the staff presented them selves and their areas of expertise, then Luisa spoke and gave a lecture about how this was going to work. After the Core Lecture in the auditorium we had to go outside and chat with the mentors. The day ended and it went great!

Days later I received an e-mail with another mission that had to be completed. Mission accomplished, then it was the waiting game. Who knew if I was in or not. It was crazy scary. I came to the conclusion that if I didn't get through this time, I was going to apply for next

semester until I got accepted. I was not going to give up that easily. So I waited and waited. The day we where supposed to get the e-mail, my mom didn't allow me to take my phone to school, probably because she knew I wasn't going to pay attention in class and I was going to be pressing the refresh button on my e-mail until I got something. That would be exactly what I would've done.

That afternoon I got out early from school because one of my teachers was absent

write about my story since the day I decided to be a mechanical engineer. Apparently the staff liked it because they sent me an e-mail saying that for the next step I needed to complete a mission. So I completed the mission and received an e-mail that said that I was invited to go to the reunion of all the possible candidates to become part of the academy. I was so happy but nervous at the same time.

she said that she was going to pick me up in a few minutes. I asked her if I'd received anything from the academy and she said no. When she picked me up she took me straight to OfficeMax because she said she needed a notebook. When we where in the notebook isle I asked her what type of notebook did she need, that's when she took out a couple of stapled papers and showed me the second page, which had weird letters and numbers describing the notebook. So I looked at her and asked her what type of description was that, and she turns to the first paper of the stapled ones and says that its the one required as a journal for the space academy. I absolutely freaked out and literally screamed in the middle of the isle. Turns out they didn't have the notebook there so the next day my mom went to another place and got it form me.

I was so, so happy that I'd gotten accepted that I told everybody at me school, until they new the story from head to toe.

pressing the refresh button on my e-mail until I got something. That would be exactly what I would've done.

That afternoon I got out early from school because one of my teachers was absent so I called my mom from my best friend's cellphone. She answered as calm as ever and I told her that I'd gotten out early, and

Being on this academy has helped me realize that I complain to much about having to many things to do in my regular day to day life. It made me understand that life is way harder that what I could see with my teenage eyes. It made me realize that we teenagers exaggerate everything and think we know everything when we really don't have the slightest idea of what having an official job means. We take everything for granted and complain about life way too much. This program has helped me see and learn how much pressure I can really undergo before I breakdown. It was shown me the true meaning of working until my eyes hurt. I am very grateful to this program for making me a better person.

WK07

Mission 6

Mission 7

List of guests for graduation/symposia

Research--take and log data Every Day

Personal Website Check

Research Website link on Personal Website

Teacher Invitation

Orphans of Apollo

WK08

Cost to launch 1kg of
Submarine 411
Gazzette V1.0 to folder
School Waste Data
Ask two (2) teachers from your school if they know the acronym BCE, and if they use it.
Compile all three (3) versions of Emergency Plan into ONE (1) report
Create a Research Report Skeleton in your Research Website
Update Journal with corrections, comments
12m Antena
Space Exploration Systems
Pyramid/ Jeopardy Game
Report Wk 03
Report Wk 04
Plant Log Report
Personal Website Update
Research Website Update
Cost of human Spaceflight?

WK09

what is a civilization?

Website update

ISS workbook--turn in

Who are the people currently at the ISS

Complete research skeleton

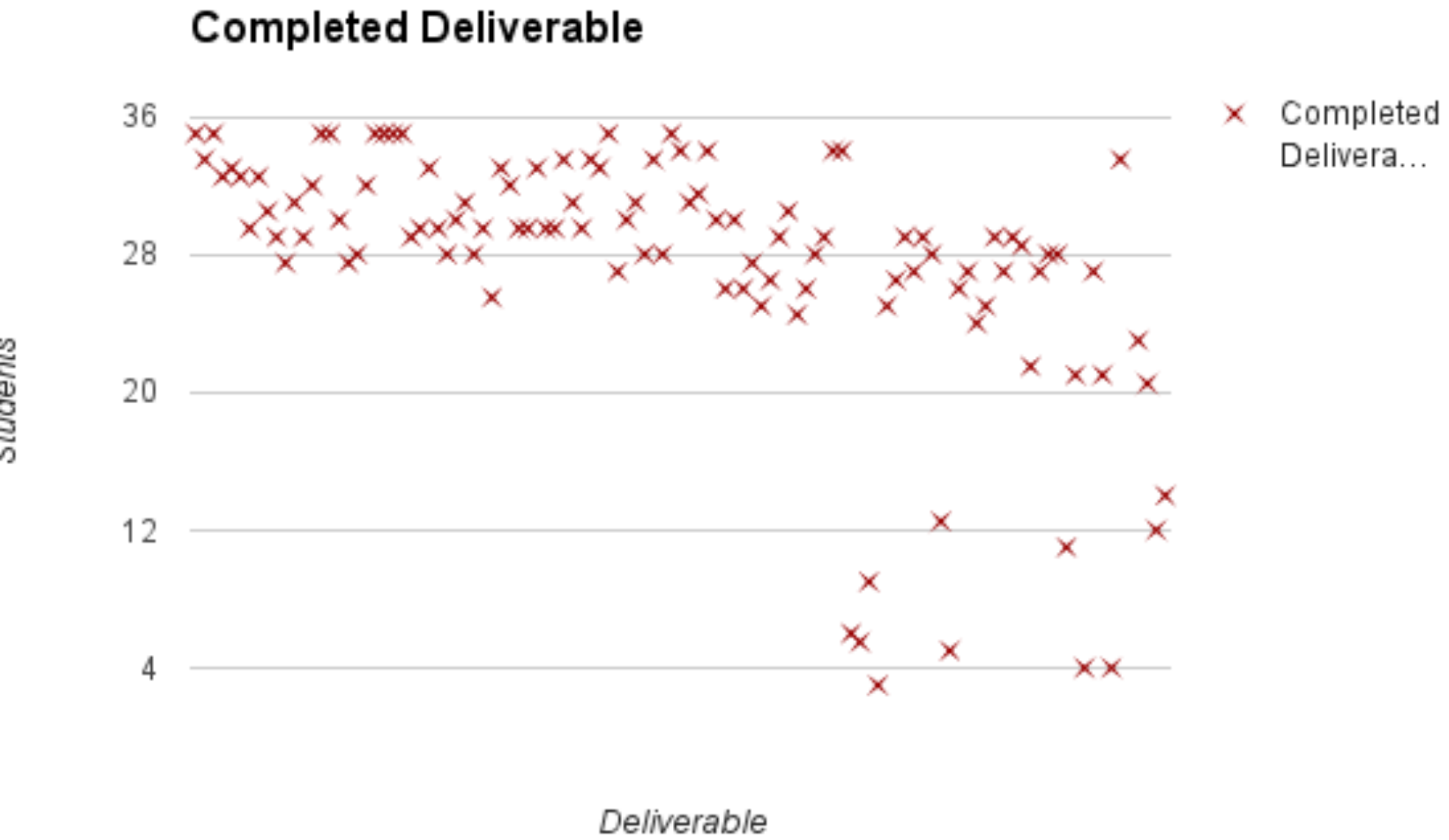
Complete final report power point skeleton

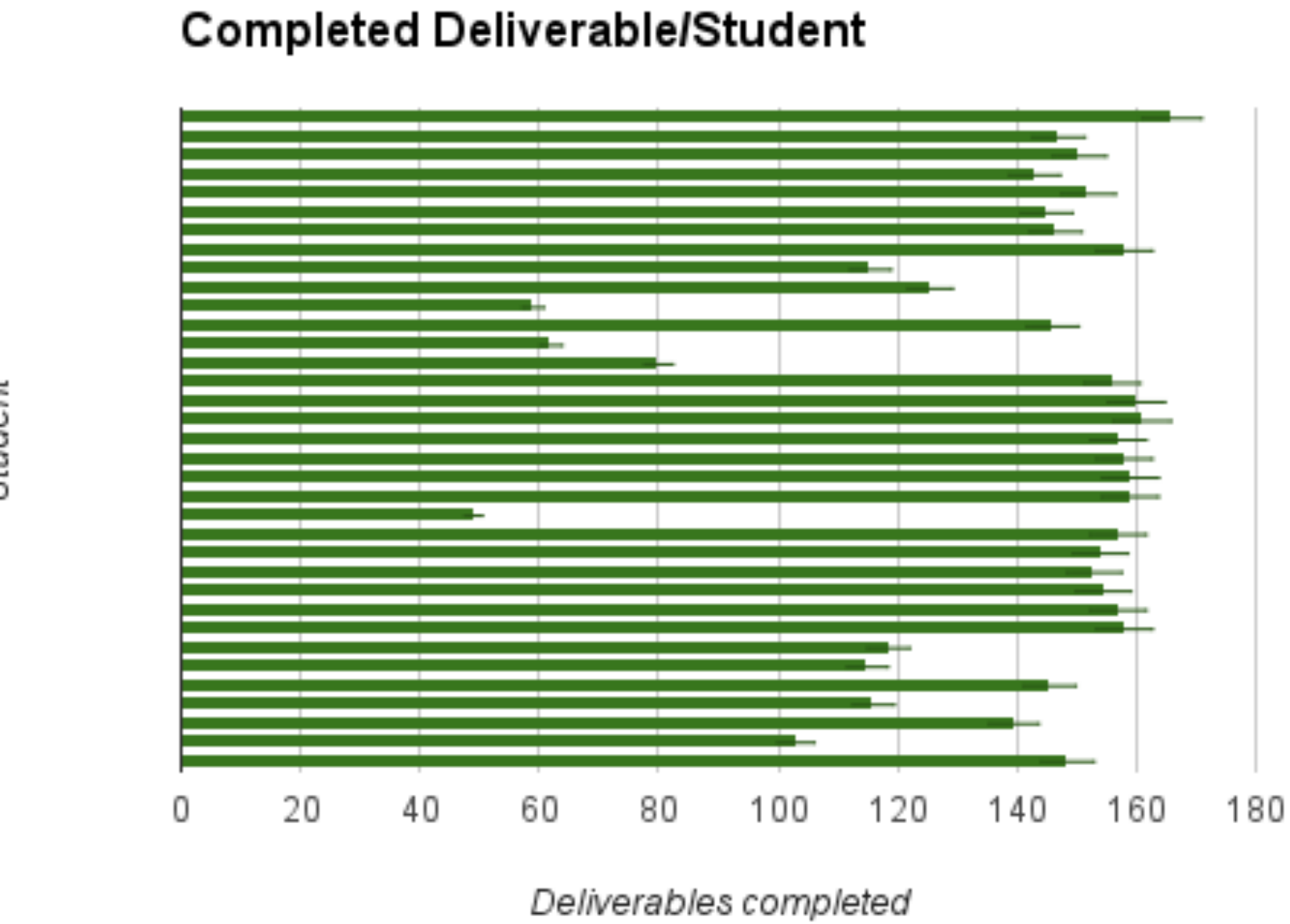
Make a staff evaluation (1 page) can be an essay, poem, acrostic, comics, song, etc. DON'T SUGAR COAT ANYTHING

Update plant log

Essay: The History of Human Civilization

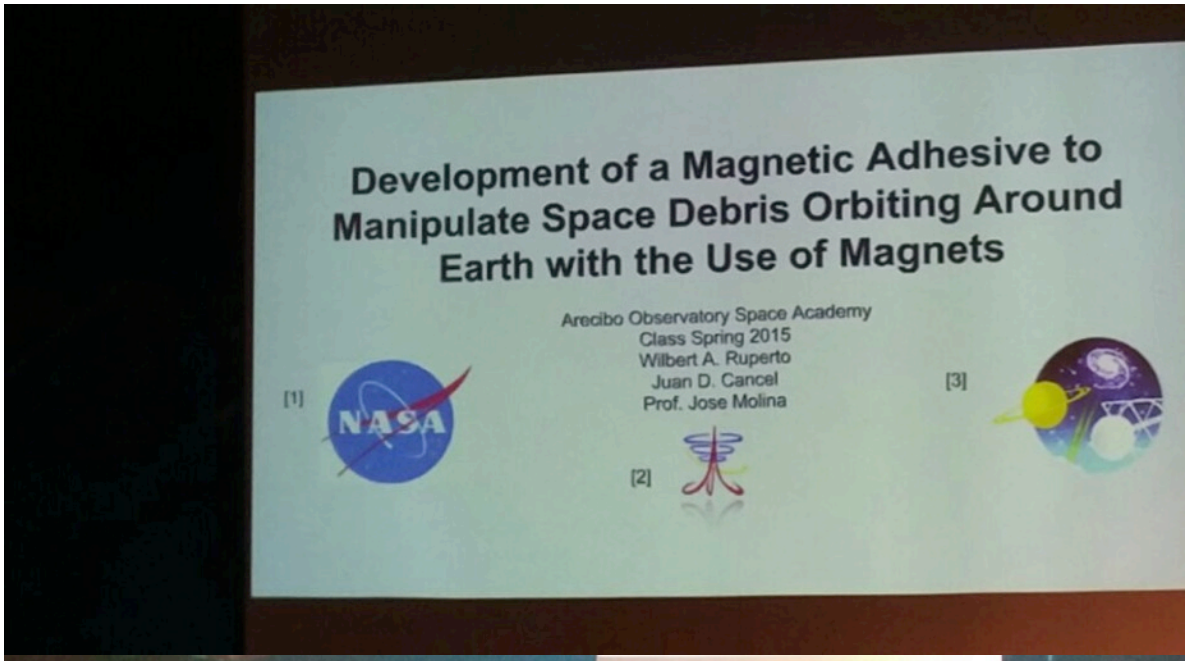
- MUST BE: 898 words
- MADE UP FROM: facts, facts that are backed up (reference them), and... more facts
- QUESTIONS TO ANSWER: what triggered the history of civilization?
- how long have modern humans excised before civilization?


Completed Deliverable
36
28
20
12
4
Students
Deliverable
Completed Delivera...


Completed Deliverable/Student
Student
0
20
40
60
80
100
120
140
160
180
Deliverables completed

WK10

- Final Research Report
- Final PowerPoint Presentation
- AOSA PRE-COLLEGE SYMPOSIA



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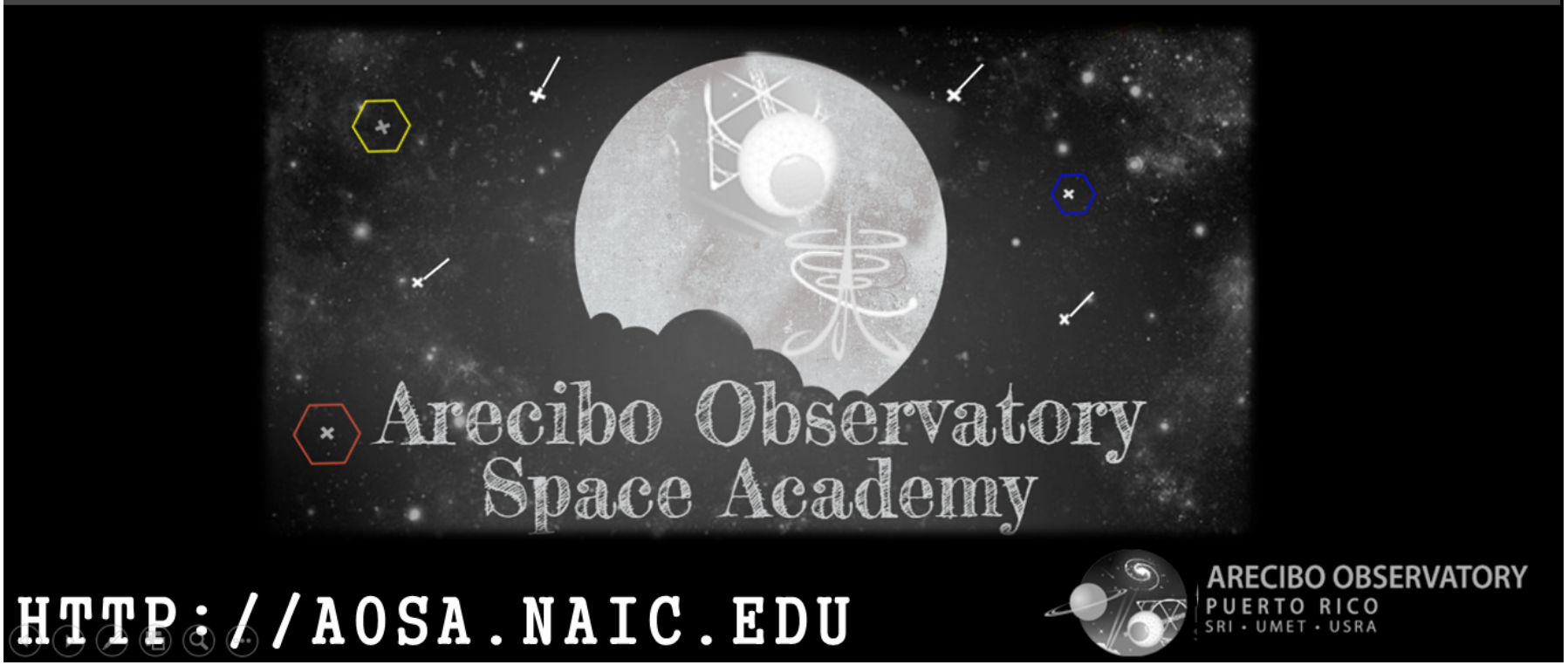
787.878.2612

CALL FOR APPLICANTS: CLASS OF FALL 2015

APPLICATION OPEN JULY 15TH TO AUGUST 14TH!



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BIOLOGY

EDWIN
2ND YEAR
PHYSICS

ROSA
3RD YEAR
EDUCATION

ORLANDO
3RD YEAR
COMP SC.

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TAMARA-
2ND YEAR
PHYSICS

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THANK YOU! FOR SUPPORTING EARTH BASED SPACE SCIENCE

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