To increase student interest in pursuing a science & space application related career, thus encouraging scientific development issuing from Puerto Rico.
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

# of Students

SP12
FA12
SP13
FA13
SP14
SU14
FA14
SP15
SU15

0
10
20
30
40
BORN AFTER APOLLO
Skills:
- Leadership & Teamwork
- Quick thinking
- Public Speaking
- Collaborative Writing
- Conceptualization
- Web search and site generation

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
METHODS. The AOSA pre-college program applies multiple instructional methods for students to expand their skills and knowledge. Being part of a scientific environment immersion helps to promote student ingenuity. Students are exposed 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 the aid of visual enhancements, such as powerpoint, videos, and white board.
COLLABORATIVE TEACHING:

students to become engaged in the learning process by sharing ideas and debating positions; assists students in establishing a personal connection among their peers bringing together their topic, ability to work as a team, communication and leadership 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

Hypothesis
Materials
Procedure
Observations
Conclusions
SS-NASA Ames Space Settlement Design Contest

- 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

• BANA 1.0: 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 won 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, Qualcomm 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
1. Cyber Security Activity: Read email from Mission#3; Complete activity
2. T5 ppt, (team): Create a 5 slide presentation with your research topic/idea to present to your team. [there can be one or more presenters, but only 5 slides in less than 5 minutes!] Please upload Presentation to designated folder
3. Emergency Plan V1.0: Prepare an emergency plan for _[Place]_ in case of _[Emergency scenario]_
4. Galactic Address: Complete the activity, upload to your folder.
5. Sticky Wall Data Tabulation: Tabulate the data from the sticky wall into one excel sheet to be shared with your team and the faculty. [One tabulation per group] Place the sheet on the folder that belongs to your research area here.
6. Research & Personal Website: Using Google Sites, create a website for your Research Project
7. Plant 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)
8. Select 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 already 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..)
9. Intelligence Test: visit this link and complete the intelligence test. Place results on your journal.
11. Journal Cover: Make a cover for your journal, its a form of free artistic expression.
12. Food Order: Complete the following food Survey.
13. Visit the links Posted on the Deliverables site.
14. Age in other planets units/Vocabulary
15. Student Research Plan
16. Sign the sign in sheet
17. Bring badge
18. log into email
19. read welcome deck
20. (individual) and a Personal Website
“How to react during an emergency” talk

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

As part of my emergency plan, it is absolutely primordial that at the start of every year’s the compulsory “How to react during an emergency” talk. The most important thing that it should cover is how to keep your marbles during that emergency, and that if you see that is obviously not keeping their marbles then you as a responsible human being and help them by looping an arm under their armpits and getting them to move. The protocol for each event and how to react quickly, since in CROEM ringing 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:

During 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 contact anyone yet, since everyone will be panicking or busy looking for cover.

For the earthquake, get out of under the surface and locate the teacher or figure of authority and follow their instructions. If you are on your room, get out to the hallway to the nearest group of students and start making a line to the nearest exit.

Fortunately, 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 signal is bad in this area, so the teacher or someone has to set up the radio from the emergency 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 Address:
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

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**AOSA SP15**
**Student Research Plan**
**NAME: _______________ DATE: ________**

**Literature Review**

<table>
<thead>
<tr>
<th>Key Questions</th>
<th>Who Did What When</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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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 LastNameFirstNameEmergencyPlanV2.0"

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
SCIENCE AND EXPLORATION FORUM 2015@AMES
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]
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.

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 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 Mejias 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
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 excited 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 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 sociocultural 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.
How to get Rid of Boring Weekends

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  
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.

| **Biology** | **Staff:** Bryan Petty  
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*
Today's Featured Article:

Because Rocket Science is pretty cool

So here is how rockets work:

Friendship fuel tank
Magic exhaust

Ok, ok, here is how they actually work

Fuel tank
Exhaust area

And why don't rockets fall down once they turn off their engines?

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 Arecibo 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 the new things. After the lectures we divide into our respective groups. My mentor, Dr. Bryan Pethy, 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 learned 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 I am a part of. The staff members are very helpful and great. They really do want to teach and help us.
AOSA SP-15
Arecibo Observatory Space Academy

As I write about the Arecibo Observatory Space Academy, or as we call it, AOSA, has been an experience. From almost having a breakdown to actually having one. This is my story of how my life has changed in just a few minutes.

AOSA started on February 7th 2015. This program involves science, technology, and engineering. We divide into four groups: Math, Biology, and Psycho-social. We get loads of homework for a set of classes called deliverables, these are to prepare us for college. The teachers encourage us to do everything on our own way, at the same time following instructions that may seem as if they are too simple, but they just make you think. They give us loads of work, making sure we will cope and if we can’t, we will not be accepted.

Four months ago my mom found out about this program called AOSA. She knew I wanted to be an engineer and she expected her to sign up. When we were at school, we had to write an essay about why we wanted to be in the program. In this essay, I chose to write about my story since the day I decided to become an engineer. Apparently the staff at AOSA wanted more than a word essay about why I wanted to be in the program. It was a challenge, but I was determined to get accepted. I waited and the day we were supposed to present to the school, I was at home and my mom didn’t allow me to go outside to school. My mom told me she was going to wait for the right time to complete the homework. She was very nervous and didn’t know what to do. The day I got accepted, I called my friend and told him how happy I was.

I was so happy that I got accepted that I told everyone at school, until they new the story from head to toe.

That afternoon I got out early from school because one of my teachers was absent. I called my mom and told her I’d gotten out early, and she said 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 told me she received a notebook. When we were in the notebook store, I asked her what kind of notebook she received. That’s when she took out a couple of stapled papers and showed me the second page, which had notes and numbers describing the notebook. I looked at her and asked her if she knew what type of description was on the page. She turned to the first paper of the stapled ones and said that it was the notebook of the Academy. I absolutely freaked out and literally screamed in the middle of the aisle. 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 happy that I’d gotten accepted that I told everyone at school, until they new the story from head to toe.
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?
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

Deliverable
Completed Deliverable/Student

Deliverables completed
WK10

Final Research Report

Final PowerPoint Presentation

AOSA PRE-COLLEGE SYMPOSIA
HANK YOU!
CALL FOR APPLICANTS:  CLASS OF FALL 2015

APPLICATION OPEN JULY 15TH TO AUGUST 14TH

Arecibo Observatory Space Academy

HTTP://AOSA.NAIC.EDU
QUESTIONS? AOSPACEACADEMY@NAIC.EDU
THANK YOU! FOR SUPPORTING EARTH BASED SPACE SCIENCE