

First Quarterly Report 2024 for Educational and Cultural Subaward (March-April -May 2024)

Outline

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Subaward Team and Recruitment Process

On March 1, 2024, the teams of the Subaward “STEM Research Experiences for K-14 Students and Teachers,” started the recruitment process. This grant will impact students and teachers from Puerto Rico, Honduras, and Nicaragua. In Puerto Rico, the team was headed by Dr. Juan Arratia (Director of the grant), Dr. Angel Arcelay (Evaluator of the grant), Professor Yiria Muniz and Milissa Rivera, Research Mentors, and Student Research Mentor Nailha Acacia. In Honduras the team was headed by Professor Exequiel Antunez, and Susy Mesa, Staff assistant, Professors Didier Chavez and Oscar Caceres site coordinators, and Milton Guevaras, research mentor. In Nicaragua, the team was headed by Dr. Kevin Morales, research mentor and site coordinator and Angie Leguizamon staff assistant.

The first activity of the of the teams of the subaward was the recruitment process. Dr. Arratia designed the following documents for the recruitment process (project description, project agenda, registration form) and the project staff and research mentors distributed in Puerto Rico, Honduras and Nicaragua.

Project Description



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VIRTUAL 2024 SATURDAY RESEARCH ACADEMY PROGRAM

Introduction. The concept of research experiences for pre-college students was initiated by Dr. Juan F. Arratia, during his tenure as Director and Principal Investigator of the Model Institution for Excellence (MIE), a project funded by the National Science Foundation (NSF) at Universidad Metropolitana (UMET), San Juan, Puerto Rico from 1998 until 2018. After more than twenty years of funding by NSF Dr. Arratia impacted and mentored more than 4,000 high school students from public and private school, across Puerto Rico. The Saturday Research Academy was successful in producing a pipeline from pre-college-undergraduate to graduate school using research as the tool to motivate thousands of pre-college students in science, technology, engineering, and mathematics (STEM) fields.

The Virtual 2024 Saturday Research Academy Program. The virtual program will be a semester long program (16 weeks), starting on March 16, 2024 with virtual meetings on Saturdays at 9:00 AM, Puerto Rico Time Dr. Arratia, and research assistants, with research experience in Honduras, Nicaragua, Puerto Rico, and US research institutions will help the participants to explore and implement the steps of the research cycle (state the problem, research information, produce a hypothesis, test the hypothesis, analyze data and draw conclusions) within specific STEM projects. During the research process the participants will work in individual research projects, learn search techniques, read scientific papers, as well as how to design abstracts and professional poster or oral presentations. Dr. Arratia and research assistants will be responsible for guiding the students on how to conduct research in an ethical way. Orientation sessions in career in STEM fields and critical thinking training will be given to students during the semester long program. All the participants will report to Dr. Arratia by e-mail, in English, on a weekly basis, reporting their progress in their weekly meetings and advances in their research projects. The design of a competitive poster must include the following segments: title, abstract, introduction, material/methods, results, references, acknowledgments and further information. A Virtual Pre-College Undergraduate

Research Symposium will be held virtually on July 16, 2024, where the participants will present the projects worked during the sixteen weeks to the high school university communities. A Symposium Proceeding will be edited by Dr. Arratia's staff, containing all the posters of the participants. The Symposium Proceedings will be available at the Foundation webpage.

Project Agenda:



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VIRTUAL 2024 SATURDAY RESEARCH ACADEMY PROGRAM

A G E N D A

March 16 to July 16, 2024

Research Meetings on Saturdays

| | |
|----------------|--|
| Week- 1 | Welcome, Pre-Test. Introduction to scientific methodology and search Techniques. |
| Week- 2 | Research and papers-reading materials. |
| Week- 3 | Research and selection of scientific references. |
| Week- 4 | Research and turn in title of the research project. |
| Week- 5 | Research and draft project abstract. |
| Week- 6 | Research and draft of introduction. |
| Week- 7 | Research and draft of methodology. |
| Week- 8 | Research and Virtual poster presentation of student progress. to Mentors and Director |
| Week- 9 | Research and draft of further work and acknowledgements. |
| Week- 10 | Research and draft of format of poster or oral presentation. |
| Week- 11 | Research and symposium registration. |
| Week- 12 | Research and submit final abstract to Director. |
| Week- 13 | Research and turn in final version of scientific poster. |
| Week- 14. | Research and digital poster and oral practices of presentations. |
| Week- 15. | Research and digital poster and oral practices of presentations. and Post-Test |
| July 16, 2024, | Virtual Pre-College-Undergraduate Research Symposium. |

For more information please contact:

Dr. Juan F. Arratia, Research Professor and Mentor juan.arratia@gmail.com

Prof. Exequiel Antunez, Comayagua, Honduras exequielantunez05@yahoo.com

Dr. Kevin Morales, UNICA, Nicaragua kevin.chamorro8@gmail.com

Research Areas: Computer Science, Biological Sciences, Biomathematics, AI, Astronomy, Game Design and Development, Robotics, Neurocircuits, Bioinformatics, Engineering, and Genomics.

Registration Form



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Virtual 2024 Saturday Research Academy Program

REGISTRATION

Name: _____

Address _____

Phone: _____

E-mail: _____

School and Grade: _____

Parent's phone: _____

Parent's e-mail: _____

Research Areas:

_____ Biological Sciences

_____ Genomic

_____ Neuroscience-Neurocircuits
_____ Robotics
_____ Computer Science
_____ Engineering
_____ Game Design and Development
_____ Applied Mathematics
_____ Translational Neuroscience, and Bioinformatics
_____ Other Topics: _____

For more information contact:

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Prof. Exequiel Antunez, Comayagua, Honduras exequielantunez05@yahoo.com

Dr. Kevin Morales, UNICA, Nicaragua kevin.chamorro8@gmail.com

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List of students recruited in Puerto Rico

Paula Rivera
Ana Pizarro
Marina Roman
Mia Ufred
Maria Gutierrez
Ann Corrie Rene
Lorinda Hannah
Izadora Fresnelle
Laeticia Fayette
Lynn Duverneae

List of students recruited in Honduras

Anjie Mejia
Fernanda Rodas
Ambar Castillo
Sayli Rodriguez
Maitre Caceres
Genesis Figueroa
Maydaris Lanza
Danllely Carrasco
Valery Galeas
Seleste Acosta

List of students recruited in Nicaragua

Natalia Guevara
Sofia Palma
Milan Guzman
Marcela Bonilla

Christiana Lucas
 Maria Fargas
 Nathally Cardenal
 Hanna Nayelli
 Amarilys Bracamontes
 Gustavo Apolinar
 Ana Sofia Pena
 Nadia Zamora
 Edwin Rodriguez
 Marisol Maldonado
 Jorelis Amador
 Sharith Prada
 Paula Mojica

=====

The first virtual meeting for the Saturday Research Academy was held on Saturday, March 16, 2024. At that meeting Dr. Arratia welcome all the participants and explained the methodology for the implementation of the research posters in areas of Science, Technology, Engineering and Mathematics (STEM). He emphasizes that all the participants will report in English their reading and learning of research topics weekly, with a deadline on Saturdays at midnight. After the presentation of Dr. Arratia, all the participants took the Pre-Test designed by Dr. Angel Arcelay, Evaluator of the grant. A copy of the Pre-Test follows:

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The Scientific Method

☐ Pre-Test ☐ Post-Test

March 2024

| | | |
|----------------|--|---|
| Research Site: | | Date: |
| Student Name: | | Mentor: |
| Age: | Sex: <input type="checkbox"/> F <input type="checkbox"/> M | Grade: <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 |

- The following are information searching methods:
 - ☐ **A:** Library, Online library database, Scientific Journals
 - ☐ **B:** Library, Friends, Newspapers
 - ☐ **C:** Online library database, Internet, My Teacher
 - ☐ **D:** Friends, Scientific Journals, Discovery Channel

2. A good research abstract has the following parts:
- ☐ **A:** Why the research was done, Collaborative partners
 - ☐ **B:** Why the research was done, Research results
 - ☐ **C:** Collaborative partners, Conclusions
 - ☐ **D:** Detailed project description, Research results.
3. In a research process, previous work searching is:
- ☐ **A:** a good practice
 - ☐ **B:** not recommended
 - ☐ **C:** not necessary
 - ☐ **D:** too much work.
4. Which of the following is correct?
- ☐ **A:** A research paper is like a report.
 - ☐ **B:** A research paper is a thesis.
 - ☐ **C:** A research paper is a scientific document.
 - ☐ **D:** None of the above.
5. What is the first step in completing the scientific method:
- ☐ **A:** Ask and define the question
 - ☐ **B:** Hypothesis
 - ☐ **C:** Observation
 - ☐ **D:** Research.
6. The second step to the scientific method is to state the "problem, the scientific question to be solved. What is one requirement that needs to be fulfilled in order for the "problem" to be valid?
- ☐ **A:** It needs to be a problem that has a number answer.
 - ☐ **B:** It needs to be a problem that can be solved with experiments.
 - ☐ **C:** It needs to be a problem that has a yes or no answer.
 - ☐ **D:** None of the above.
7. A requirement for experimental data by the scientific method is?

☐

A: Only one experiment is needed.

☐

B: Experiments could be repeated.

☐

C: The experiments are not repeated.

☐

D: All experiments provide different results.

8. Which are the main components of a poster?

☐ Title, Authors, Abstract and/or Introduction, Methodology, Results,

A: Conclusions, References, Acknowledgements.

☐ Title, Authors, Methodology, Results, Conclusions, References,

B: Acknowledgements.

☐ Title, Authors, Abstract, Introduction, Methodology, Results

C: Recommendation, Conclusion

☐ Title, Authors, Abstract, Introduction, Methodology, Results,

D: Recommendation, Future Works.

9. How many independent variables can you have during an experiment?

☐

A: 1

☐

B: 2

☐

C: As many as you would like.

☐

C: The same amount as the number of controlled variables

10. How many controls group can you have in an experiment?

☐

A: 0

☐

B: 1

☐

C: 2.

☐

D: As many as you would like

Evaluator Analysis



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Virtual 2024 Saturday Research Academy Program

Report of Results from Pre-Test to the Virtual 2024 Saturday Research Academy Program

A quiz of **10 questions** as a pre-test was provided to the students registered at the Academy. The quiz consisted of ten questions mainly about the **scientific method** with 2 final questions about data handling. The answers of **36 participants** are included in this information. **Twelve 12** participants answered more than 70 % of the questions favorably. **Five 5** participants answered less than 3 of the questions favorably. The rest of participants, 19 are between the two groups.

Following are the research titles of students by group.

Puerto Rico Group

Phylogenetic analysis of Phosphorus Solubilizing Bacteria (PSB).

Antimicrobial potential of *Nepeta cataria* strains from Haiti.

Advances of Soft-Prosthetics Finger green technology.

Practical approach and considerations in the development of a quiz game for blind people.

Utilization of Natural Pesticides for Enhanced *Colocasia esculenta* (Taro) protection in Haiti.

Isolation and characterization of *Tardigrades* specimen in Port au Prince.

Haitian educational environment and its limitation for students with dyslexia.

Causes of Primary Intracerebral Hemorrhages in Haitian teenagers.

The Impact of Tik Tok on Theoretical Astronomy Education

The Development of Improved Environmental techniques for relieving Ocean Acidification through Capture of Carbon Dioxide Emissions

Apprise and explore the negative Impact of AI on High School Students

Enduring long-COVID and coronamic in Low-Income Minorities in Puerto Rico

Nicaragua Group

Intelligent Virtual Assistants for the Management of Chronic Patients using Artificial Intelligence

AI-Based System for Detecting Infections in Open Wounds

Skin Cancer Diagnosis through Image Analysis using Artificial Intelligence

Breast Cancer Diagnosis through Mammograms Assisted by Artificial Intelligence
 Facial Vital Signs Recognition using Artificial Intelligence Algorithms
 Disease Diagnosis through Facial Analysis using Artificial Intelligence
 AI Assistants for the Diagnosis and Treatment of Heart Diseases in Children
 Detection of Harmful and Carcinogenic Ingredients in Product Labels using AI
 Diagnostic Tool for Child Psychiatry using Artificial Intelligence
 Intelligent Virtual Assistants for Home Management of Alzheimer's Patients
 Mathematical Learning Based on the Singapore Method Guided by Artificial Intelligence
 AI-Based Chatbot for Solving Everyday Problems
 Personalized Psychological Assistance for Low-Income Children using Artificial Intelligence
 Intelligent Tool for the Diagnosis and Treatment of Dermatological Diseases with AI
 AI-Assisted Collaboration Platform for Developers
 Educational Chatbot for Teaching Mathematics and Learning Techniques using AI
 Diagnosis and Prognosis of Veterinary Diseases and Emergencies using Artificial Intelligence
 Design of Educational Video Games for Children using Artificial Intelligence
 Application of Artificial Intelligence for Assistance in Plastic Surgery Procedures
 Artificial Intelligence for Identifying and Improving Energy Sources in Space Rovers

Honduras Group

Automatic Response Bots in Purchasing
 Brain Plasticity and Memory at Risk: The Impact of Early Stress on Pre School-Children.
 Mathematical Modeling of Dengue Transmission: Analysis of Control Strategies in la Paz, Honduras
 Environmental Engineering: Recycling in Honduras compared to European Countries
 Urban Development for Economically Disadvantaged Citizen in Honduras
 Ancestral Maya Cuisine as a Tourist Attraction in Honduras

Fulbright Visiting Scholars Series

The following Fulbright Visiting Scholars Series Conferences were implemented during the First Quarterly Report of the Educational and Cultural Subaward:

- 1.- **The History of Artificial Intelligence** by Dr. Moez Ben Haj Hmida, Fulbright Visiting Scholar (2023), National Engineering School of Tunis, Tunisia, on April 6, 2024.
- 2.- **A Journey throughout Our Solar System** by Dr. Damya Souami, Fulbright Visiting Scholar (2023), Observatoire de Paris, France, on April 20, 2024.
- 3.- **Culture and History of Nepal** by Professor Bharat Dhungana, The Small Earth Nepal, Kathmandu, Nepal on April 27, 2024.
- 4.- **Space Based Sensors for Earth Observations** by Aaron Pereira, PhD Fulbright Visiting Scholar *Adelaide, Australia (2023), on May 4, 2024.*
- 5.- **Human Activity Recognition Using Synthetic Data** by Dr. Stanislav Panev, Fulbright Visiting Scholar-Bulgaria (2015), Carnegie Mellon University, on May 18, 2024.

Dissemination of the conferences was done by distributing a typical flyer for each talk like the following document:

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Invite you to attend the Virtual Conference:

**A Journey throughout Our
Solar System**

Presented by:

Dr. Damya Souami
Fulbright Visiting Scholar (2023)
Observatoire de Paris
Paris, France

Saturday, April 20, 2024

11:00 AM EST

Meet Link:

<https://meet.google.com/uqp-epgc-wbd>



Voluntary Work for the First Quarter in the Educational and Cultural Subaward

Dr. Juan F. Arratia, Lead Director of the grant had a contribution of 10 hours per week for a total contribution of 140 hours for the first Quarter of the grant.

Dr. Kevin Morales, Lead Director for the Nicaragua Group had a contribution of 6 hours per week for a total of 84 hours for the first Quarter of the grant.

Visit of Dr. Juan F. Arratia to La Paz, Honduras

On April 19, 2024, Dr. Juan F. Arratia travelled to La Paz, Honduras to visit the students, teachers and staff of the program. Using the return trip to the Partners of the Americas International Board Meeting in Mexico City Dr. Arratia meet the Honduras Team and students on Saturday, April 20, 2024, at La Paz, Honduras. Students presented their advances, and the Team staff (Dr. Arratia, Professors Exequiel Antunez, Didier Chavez and Oscar Caceres) gave instruction how to finish their research work. The following photo shows the interaction of the team members, students and science teachers,

Meeting of Dr. Juan F. Arratia and Honduras's Team Members with students and science teachers at La Paz, Honduras on Saturday, April 20, 2024.

