REPORT

TIEMPO, CLIMA Y VOS

WORKSHOPS FOR STUDENTS ON WEATHER, CLIMATE VARIABILITY AND CLIMATE CHANGE

With the support of the Embassy of the Republic of Korea in Costa Rica, KOICA and ACEKO, three workshops for students were conducted in August 2024 in the framework of the KOICA clubs.

Prepared by

Ana María Durán Quesada

TABLE OF CONTENTS

TIEMPO, CLIMA Y VOS

As global warming exacerbates the impacts of extreme events, contributing to increase awareness in the younger population becomes essential. Tiempo, Clima y Vos aims at supporting education on the impacts of global warming and its connectivity with weather and climate.

The context of the climate crisis is often surrounded by a negative setting, with little prospects for a better future. The pessimistic approach to address the issue of anthropogenic global warming contributes to increase anxiety in the population. With the idea of our role in the biosphere and responsibility to work for a better future, we envision the importance of education oriented towards solutions and climate action. Science based solutions are often suggested as part of the puzzle pieces to contribute to mitigation and adaptation actions as we speak of the impacts of climate variability and change. In this regard, the activities integrated to shape the Tiempo, Clima y Vos workshops were proposed to the Embassy of the Republic of Korea in Costa Rica and, with the support of the Embassy, KOICA and ACEKO the first series of workshops were developed in 2024 as part of the KOICA Clubs activities.

To be prepared to mitigate impacts of severe weather, extreme events such as droughts and flooding and extreme heat requires to understood how these phenomena occur and how their occurrence impacts our daily life, agricultural produce, water resources, health, livelihood to mention a few aspects. Our interaction with weather and climate becomes the essence of the workshops, and how we can all understand the science behind their most important concepts and processes. The role of scientists to be close with the different groups to exchange, share and co-create knowledge with the communities was a driver of the activities. With interactive activities, students from 7 to 17 years old learned and exchange experiences related to cloud formation processes, El Niño-Southern Oscillation phenomenon, global warming, coral bleaching, greenhouse gases emissions and the water cycle among many other concepts.

ACTIVITIES BASED LEARNING

Learning materials were prepared and provided to students and teachers.

- **Global change cards**: Sets of cards with images of different processes such as greenhouse gases emissions, sea level rise, increasing temperature, reduction of sea ice and polar ice caps, flooding, landslides to be paired with causes and impacts were provides to the students to create storylines based on their knowledge and experience with global warming. Creating the stories in groups, the students exchanged their opinion and engage in discussions with peers, researchers, and teachers.

- **Climate change trivia game**: A deck of 21 trivia cards was designed to challenge the students and create an interactive evaluation process on what they know and how to contrast myths and facts related to the understanding of the physical basis of climate change. All students received a deck to play with classmates, friends and family, looking to create a nice experience for learning and share knowledge with others.

- **Leaflet on the water cycle and the sustainable development goals**: An information leaflet were prepared for the students, with information on differences between weather and climate, the main processes of the hydrological cycle, the SDGs and featuring the role of the Korean Peninsula in the development of the first graduated rain gauge known as named Cheugugi during the reign of King Sejong.

EXPERIMENTS DESIGN

A series of experiments, that the students could replicate, to explain weather, climate variability and change as well as processes within the hydrological cycle were prepared.

- **Cloud formation**: creating a cloud in a bottle with water and alcohol spray, a pump and a carefully used flame was used to explain the formation of clouds with the basis of moisture, temperature changes and pressure variations. In this experiments the role of cloud condensation nuclei was explained to introduce the role of aerosols and pollutants in the dynamics of cloud formation. Ratios of liquid water, vapor and ice were discussed in terms of the relationship between saturation and the visible color of the clouds.

- **Pressure driven currents**: an experiment with a water container, a glass vase and a flame to simulate the vacuum effect was used to explain how pressure changes induce the movement of water and air to create accelerated currents. The concepts of salinity, density and gradients were introduced following this principle for movement or the atmosphere and the oceans.

- **El Niño- Southern Oscillation and coral bleaching**: creating ENSO with a water container, a hair drier and oil allowed for a detailed discussion on the oceanic and atmospheric components of ENSO. The concept of thermocline was introduced using the oil layer over the water and with the air blowing from the drier the role of the easterly winds was explained. How these conditions with the pressure gradient impact the Walker circulation was presented to explain why the global precipitation patterns change during ENSO events.

- **Role of vegetation to mitigate the impact of heavy rainfall**: using three containers with soil and different density of plants recreating vegetation were used to introduce the concept of surface runoff, soil erosion and the role of vegetation to reduce surface runoff and protect the soil during heavy rainfall events.

LICEO ACADEMICO DE CASCAJAL, CORONADO

Cascajal is a rural community in the Vasquez de Coronado canton. The Liceo Académico de Cascajal is the public high school, located in an area in which farming is the main economic activity. It is common in this region that high school students help their families with farming before attending classes, weekends and spare time. This region is well known as a cloudy, with fog and temperate climate. However it is experience a fast temperature increase which contributes to reduce the fog conditions and affects dairy farming.

A group of 56 students of eight grade (13-14 years old on average) accompanied by 5 teachers and staff participated of the workshop on August 12nd, 2024. Professors Laura Brenes (CICA-UCR), Ana María Durán Quesada (EFis and CICA, UCR) and Raquel Ramírez (Agronomy-UCR) facilitated the workshop. Sub-director of the School and Orientation personnel welcomed the group from the Embassy of the Republic of Korea on behalf of the director Ana Maritza Coccozza.

CONSERVATORIO DE CASTELLA, HEREDIA

The Conservatorio de Castella is an arts oriented institution located in the Heredia province. Albeit it is operated by a foundation, it is dependent on the Ministry of Public Education. Students learn music, painting, dance and theater since primary level. The institution is active in the development of activities that nurture the arts and its links to science, the environment and society.

Director of Conservatorio de Castella, Dr. Luis Cascaste welcomed the delegation from the Embassy of the Republic of Korea and president of ACEKO in August 16th. With an audience of 6 teachers and 92 students of ages between 7 and 17 years old, the workshop was developed. A presentation of the musicalization of greenhouse gases emissions measurements in coffee plantations by Physics student Darío Badilla introduced the links between arts and climate science. Meteorologists Raquel Ramírez (Agronomy-UCR) and Mariana Morales (EEAFBM-UCR) conducted a climate change trivia activity. Juan Chin (CICA-UCR) and Ana María Durán Quesada (EFis, CICA-UCR) developed the experiments with explanations of the processes.

ESCUELA MANUEL DE JESUS JIMENEZ OREAMUNO

The school Manuel de Jesús Jiménez Oreamuno is in Tierra Blanca, Cartago province, located in one of the main agriculture lands of the Central Valley. Albeit this region is known drier compared to other areas of Cartago, heavy rainfall events are frequent. Soil erosion rapidly aggravates the problem of surface runoff when moderate to heavy rainfall occurs. This region, proud of its agricultural produce and traditions features a temperate climate, with cold night temperatures which are experiencing the impacts of warming and changes in precipitation patterns.

Director Hazel Jiménez welcomes the representatives of the Embassy of the Republic of Korea and ACEKO president on August 21st with a visit to the school buildings. The experiments were conducted for an audience of 60 elementary school students (7-9 years old) and 5 teachers by professors Raquel Ramírez (Agronomy-UCR), Gabriela Mora (EFis, CIGEFI-UCR), Ana María Durán Quesada (EFis, CICA-UCR) and meteorology student Christopher Soto. Questions games activities were developed by Mariana Morales (EEAFBM-UCR) and Marian Quesada (CIGEFI-UCR).

ACKNOWLEDGEMENTS

We thank the support from the Embassy of the Republic of Korea, KOICA and ACEKO that allowed the Tiempo, Clima y Vos workshops to benefit 208 students and 16 teachers this year as part of the KOICA Clubs.

The financial support provided covered the following aspects of the workshops:

- **Climate cards decks**: climate cards decks were provided to the school staff to have available in the library so that teachers and students can use them for different activities.
- **Trivia cards**: a full climate change trivia set was given to each student to play with family and friends and share the knowledge of the myths and facts of climate change.
- **Water cycle and SDGs information**: printed leaflets of the water cycle processes, the SDGs, precipitation measurements history related to the Peninsula of Korea and differences between weather and climate were given to each participant.
- **Catering**: all participants received a healthy breakfast composed of a fruit bowl with yoghurt and muesli, a ham and cheese sandwich and a fruit juice.

The development of the activity was successful thanks to the support of enthusiastic students and teachers from the different institutions, the assistance provided by the Embassy of the Republic of Korea, KOICA and ACEKO, the help of an interdisciplinary team of personnel and students from Universidad de Costa Rica from different areas including Physics, Meteorology, Chemistry, Sociology and Agricultural Sciences.

With the SDGs goal of leaving no one behind, we appreciate the support of all people involved to help construct more bridges between science and society, with the young students at the center of information for climate action.