



ECOSF
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Sukkur
IBA
University

Workshop Report

CAPACITY BUILDING WORKSHOP FOR SCIENCE TEACHERS ON CLIMATE CHANGE EDUCATION

March 28 – April 1, 2022.
Islamabad, Pakistan

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Executive Summary

Pakistan is one of the most vulnerable countries to the impacts of climate change in the world. The country is expected to face severe extreme climate events. Hence there is an urgent need for the adaptive capacity of communities through adequate science education and enabling citizens to make informed decisions in the context of climate change.

Recognizing this need, the ECO Science Foundation (ECOSF) in collaboration with Sukkur IBA University (SIBAU), UNESCO and the Pakistan National Commission for UNESCO (PNCU) organized 5 days Capacity Building Workshop for Science Teachers on Climate Change Education in Islamabad from March 28- April 1, 2022. It is important to mention that ECOSF together with SIBAU won the grant under participation programme of UNESCO for hosting this workshop in Pakistan.

The prime purpose of this training was to produce a cadre of science teachers who can effectively deliver training programmes on climate change education for their peers using Inquiry Based Science Education (IBSE) pedagogy. Over 30 science teachers from all across Pakistan participated in the workshop. The training workshop underscored that Science education plays a vital role to prepare societies for the future global challenges, including the climate change.

This Workshop on Climate Change Education was a very good platform to produce teachers who are competent and skillful in engaging students with latest issues on climate change. During this intense five days workshop, participants learned about the impacts of climate change in Pakistan and the major concepts related to climate change: change, biosphere, greenhouse phenomena, impacts, mitigation, adaptation and Disaster Risk Reduction (DRR).

Workshop also equipped science teachers to understand better the learning methodologies and enhanced their skills, knowledge and competency around climate literacy and discussed how to best integrate climate change in classroom.

Acknowledgements

Sukkur IBA University (SIBAU) and ECO Science Foundation acknowledge the cooperation and support of organizing partners; Pakistan National Commission for UNESCO (PNCU), Office for Climate Education, Paris (OCE) and *La Main a la Pate* (LAMAP) Foundation, France for making this Capacity Building Workshop a great success. We would also like to thank all the international trainers, participants and collaborators for their significant contributions to the Workshop.

Credits

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Introduction

Pakistan is one of the most vulnerable countries to the impacts of climate change in the world. The country is expected to face severe extreme climate events. Hence there is an urgent need for the adaptive capacity of communities through adequate science education and enabling citizens to make informed decisions in the context of climate change.

Recognizing this need, the ECO Science Foundation (ECOSF) in collaboration with Sukkur IBA University (SIBAU), UNESCO and the Pakistan National Commission for UNESCO (PNCU) organized 5 days **Capacity Building Workshop for Science Teachers on Climate Change Education** in Islamabad from March 28- April 1, 2022. It is important to mention that ECOSF together with SIBAU won the grant under participation program of UNESCO for hosting this workshop in Pakistan.

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About the Trainers

Lead Trainers from Institute of Teacher Education, Malaysia; Prof. Abdul Muhaimin Osman and Prof. Rajab Aziz conducted the training workshop with their core expertise in Science Education using Inquiry Based pedagogy. Prof. Osman is currently serving as the Director of Institute of Teacher Education, Perlis Malaysia, while Prof. Aziz had been associated with this institute as former faculty and science educator.

Previously, Prof. Osman and Prof. Aziz have designed and conducted several training modules for science teachers to help them develop effective learning and teaching delivery skills and practices in many countries. Science teachers during the workshop were quite excited, engaged and inspired as the trainers during workshop employed interactive approach with many hands-on activities on climate science.

It is important to note that the lead trainer Mr. Osman has previously attended three International Workshops on Climate Change Education, including one which was conducted online. He is also an experienced ISTIC (International Science, Technology and innovation Centre for South South Cooperation under the auspices of UNESCO, Malaysia) trainer on Inquiry-Based Science Education (IBSE) as he was trained numerous times by *La Main a la Pate* (LAMAP) France in their international workshops.



*Mr. Abdul Muhaimin Osman,
Lead Trainer and Science
Educator, Institute of Teacher
Education, Malaysia*



*Mr. Abdul Aziz Bin Rajab,
Co -Trainer and Science
Educator, Institute of Teacher
Education, Malaysia*

Proceedings of the Workshop

The trainers planned to conduct this training based on the training methodology developed by Office of Climate Change (OCE, Paris) training modules and adapt according to the needs of science teachers. The main focus was to deliver the concepts of Climate Change and how to bring those concepts into the classrooms. Besides trying to make all participants realize the importance of climate change education, trainers demonstrated to show how to impart those concepts and ideas through planned lessons derived by designing suitable Conceptual Frameworks. Activities and small-scale experiments were planned and conducted to help participants acquire the knowledge and skills on how to relate climate change to the young minds. Trainers tried to have as many experiments as possible and requested ECOSF to prepare all the equipment and materials.



Inaugural Ceremony of the Workshop

During the inaugural ceremony of the workshop, renowned scientist **Prof. Pierre Léna- the brain behind establishment of OCE Paris**, delivered his keynote speech. Prof. Léna is the Co-Founder La main à la pâte (LAMAP) Foundation, & Renowned French Astrophysicist, Paris, France. Prof. Léna presented the global scientific view of the climate change and suggested the interventions to integrate climate change education into classroom.



Academician Dato' Ir. (Dr.) Lee Yee Cheong, Honorary Chairman, Governing Council, International Science Technology and Innovation Centre for South-South Cooperation under the auspices of UNESCO (ISTIC) Malaysia, President of Belt and Road International Science Education Consortium (BRISEC) and Former Chairman of Global Council of the InterAcademy Partnership (IAP) Science Education Programme (SEP), who is also a member of ECOSF's International Advisory Board, participated as the Chief Guest through the video link from Kuala Lumpur Malaysia.

Prof. Dr. Manzoor Hussain Soomro, President ECOSF welcomed the participants and underlined the role of ECOSF in promoting science education and ongoing capacity building programmes for science teachers in the ECO region.



Representatives of partnering organizations including, Secretary General PNCU Syed Junaid Akhlaq, lead Trainer Mr. Osman and Mr. Mujeeb ur Rehman from Sukkur IBA University also spoke during the ceremony. Mr. Khalil Raza participated as the master of inaugural ceremony and presented an overview and objectives of the workshop.

Day 1: Introduction and Workshop Learning Outcomes

The workshops started with a simple ice-breaking session where, the trainers introduced themselves and followed by all the participants. It is important to mention here that not all the participants were primary and secondary science teachers, but they came from various backgrounds. Some were private trainers, college lecturers and even university lecturers. Even among the teachers, some of them were not science teachers but language teachers; however they had some prior understanding of the concepts as determined through filling an online questionnaire. Trainers knew well that they had quite a huge task at hand to make the workshop a success. It was a challenge even when delivering pedagogical materials to teachers with different levels of competencies, let alone to those with no pedagogical knowledge. Nevertheless, trainers were determined to make it work by adapting their approach for the subsequent sessions.

As trainers wanted every participant to understand the nature and outcome of the workshop and what was expected from each of the participants, they explained in detail all the Workshop Learning Outcomes so that all participants could put their heart and mind into achieving those outcomes. As per the trainers' experience in the past where training programme that included pedagogical skills, participants never went through 'practice period' where they try to practice what they have learnt in

the workshop. Hence, trainers made sure to impart new pedagogical skills to teachers where participants can assess new acquired competencies among the participants.

The Workshop Learning Outcomes were that the participants would be able to:

- i) Deliberate issues on Climate Change
- ii) Design simple experiments on Climate Change based on IBSE principles
- iii) Develop Conceptual Framework for Climate Change sequence of lessons
- iv) Write detailed Climate Change lesson plan to used as real classroom lesson.
- v) Practice teaching Climate Change lessons in real classroom situation.



Day 2 – Climate Science & Greenhouse Effect and Gases

The first session started with group brainstorming and discussion on Greenhouse Effect concept. The purpose was to get participants initial understanding of Greenhouse Effect and gases. The idea was not to explain the answer right away but to see all the misconception that may arise. The groups presented their concepts using diagrams and drawings. That activity was followed by designing and implementing experiment on Green House Effect. The groups came up with several designs but took much time to decide on the one that would eventually be undertaken.

After much persuasion, all but one groups decided to carry out the experiments outside the hotel where the sun was shining brightly. It was quite surprising that at first, they were reluctant to go out where it was the perfect condition for participants to control their important constant variable which was the light energy. After they had finished collecting important data, they transferred the data into meaningful presentation on large white paper and took turns to present their findings.

There were many weaknesses identified through that activity. The first was the ability to work and think scientifically. This was apparent when many groups found difficulties identifying relevant variables for the experiment, time of exposed sunlight (manipulating variable), temperature (corresponding variable) and all constant variables. The idea of trapped gases was also quite difficult for some to model, though it was quite simple. They also did not try to get some ideas from the

internet and may be because they could not get the right key word to search. Trainers were expected to carry out two experiments but managed only one for the morning session.



Trainers then carried out Carbon Footprint activity for the afternoon session. This also came as a pleasant surprise because at first, trainers thought it would be difficult to sustain interest during afternoon. But everyone was happy, as the idea really hit every single participant, as humans are very much responsible for earth's total carbon output. That activity could be a good example on how a simple activity but very close to our students, could be a very stimulating and meaningful activity and allow students to grasp the concept effectively. There was even one participant who started to reduce food intake immediately!

Day 3 – Climate and Oceans

The day session began with the introduction of 27 questions embedded in online quiz apps, Quizizz. The session went smoothly with participants competing to answer each question in 20 seconds. When trying out this activity, a total time of 20 seconds was allocated to answer the quiz, which was quite fast regarding some of the questions required some reading. Overall, it was still considered a success in introducing questions on climate change.

This session was followed by the trainer asking the groups to answer two questions regarding Climate and the Ocean. The groups discussed their answers and presented their answers on large white paper. The participants then carried out two experiments to demonstrate the different effect of melting sea ice and land ice. It was necessary to counter misconception that melting sea ice raises sea level. Only the melting of land ice that raises sea level. The second experiment was to observe the effect of sea acidification caused by increased dissolved CO₂ in sea water. The last experiment was to show that

water expands due to increase in its temperature. Each participant recorded their findings in their 'science notebook'. The session again went beyond the allocated time as the Digital pH Meter needed initial calibration.



Afternoon session was rescheduled to special recorded presentation on Climate Change & Food Choices, Agriculture and Ecosystems by Dr. Simon Klien, from the Office of Climate Change Education (OCE), a UNESCO Category 2 Centre in Paris, France. This was followed by Q and A and finally the trainer shared a video on Climate Change titled "Our Planet Our Business". The video which was produced by Netflix was well-received by all the participants as it summarized the whole concepts of the workshop. One good video can actually help teachers to achieve some difficult learning outcome emphatically.

Day 4 – Conceptual Framework for Climate Change Education

The focus of the day was to introduce to all participants the idea of developing Conceptual Framework for Climate Change Education. After a short presentation by the trainer, participants were guided to develop one example of Conceptual Framework from a selected theme. Participants were asked to take turns to give a simple statement in a complete sentence as the backbone of the Conceptual Framework. They wrote their statement on sticky notes and came to stick their notes on the chart in front. The trainers then asked them to link one statement to the other using arrow sign. Once completed the participants had the idea of what conceptual framework meant in this context.

The participants worked in their respective groups to prepare their groups' conceptual framework based on the climate change themes suggested earlier by the trainers. The trainers guided them with the right method of developing the framework, especially the need to write each statement in a complete sentence and not as topics or subtopics. The understanding of the whole idea was there but many groups still had many incomplete sentences as their basic element of the conceptual framework. The complete sentences were very important later, when they were much easier to help participants write specific learning outcomes for each lesson. The Conceptual Framework developed by each group would create a sequence of lessons for a small topic on Climate Change.

Through presentation and some deliberation by the trainer, each group rectified and improvised their Conceptual Framework and continued to fill up relevant information in the Sequence of Lessons form. Due to time constraint, all groups needed to complete their task after workshop hours. This was expected from the beginning, since this activity or rather idea, requires 9 hours of interaction! Trainers were happy with the level of participants' understanding, even though, they spent only four hours on this activity. This activity was similar to preparing a Project Based Learning package for a single topic or subtopic, but this idea of conceptual framework emphasized on the concepts to be taught.



Afternoon session was special visit to Pakistan Museum of Natural History, National Skills University of Pakistan and Lok Virsa Museum.

Day 5 – Lesson Design and Planning using Inquiry Based Pedagogy

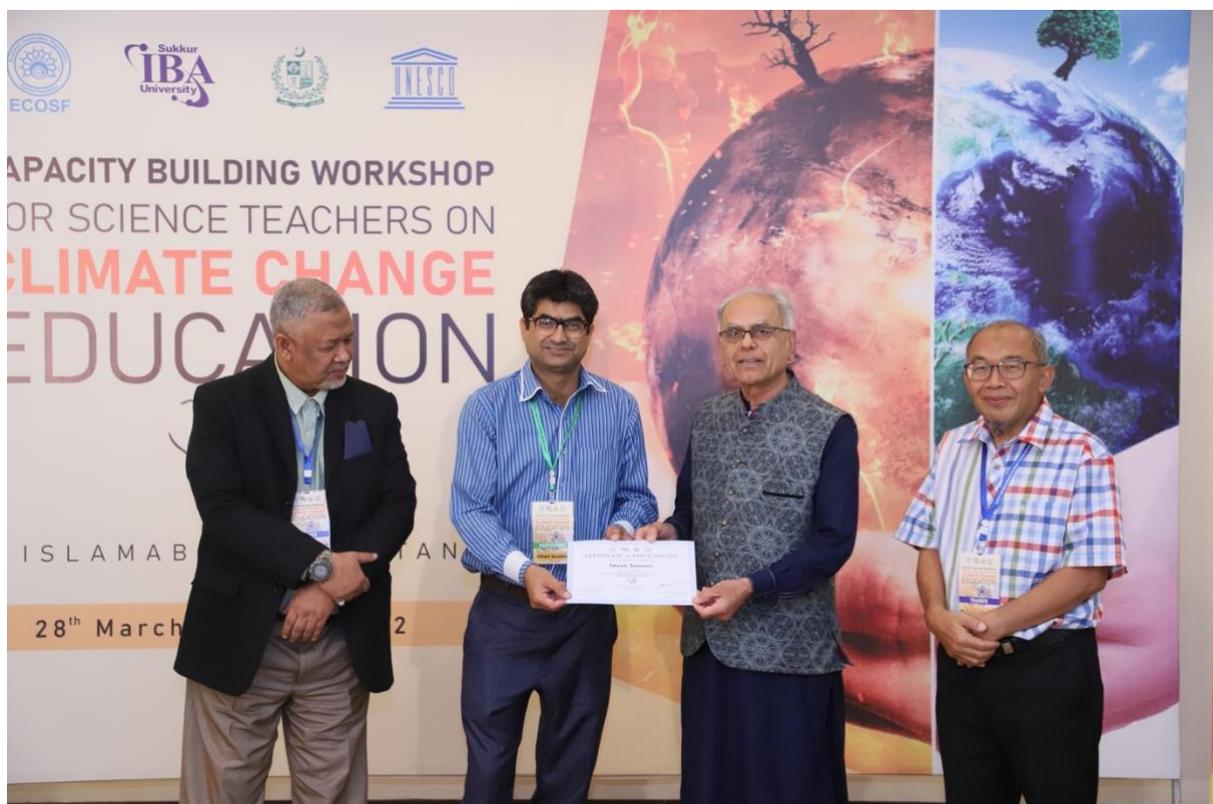
The last day was dedicated to the writing of one complete lesson plan for each group. First the trainers gave short presentation on the transformation from Conceptual Framework to a Sequence of Lessons and finally to writing a lesson plan. In order to encourage participants to complete the task as early as possible, this task was still assigned as group work.

Among the difficulties for the participants, was the ability to write quality learning outcomes for the lesson. The other was to create activities which were in line with the learning outcomes. Some also didn't base their lesson plan on any of the three popular inquiry lesson plan namely, LAMAP model, 5Es and Needham's Five Phase Model, which were introduced earlier by the trainers. Common loopholes though explained in the trainer's presentation were clearly noticed when their tasks were discussed. The trainers however managed to highlight again the weaknesses and common mistakes

during the group presentation. This it is hoped, would help every participant when they write their own lesson plans during the Post Workshop Programme.



During the last session in the afternoon, the trainer concluded the workshop by having short reflection session. Then the trainer presented the concept of Post Workshop Program. Participants were required to continue with the ECOSF Climate Change Workshop. As this initiative got the blessing from ECOSF, the trainer explained that every participant would have to prepare one complete lesson and teach the lesson at least once a month, beginning June 2022. They must submit the lesson plan softcopy and the recording of the teaching and learning session using the free Learning Management System, Schoology.



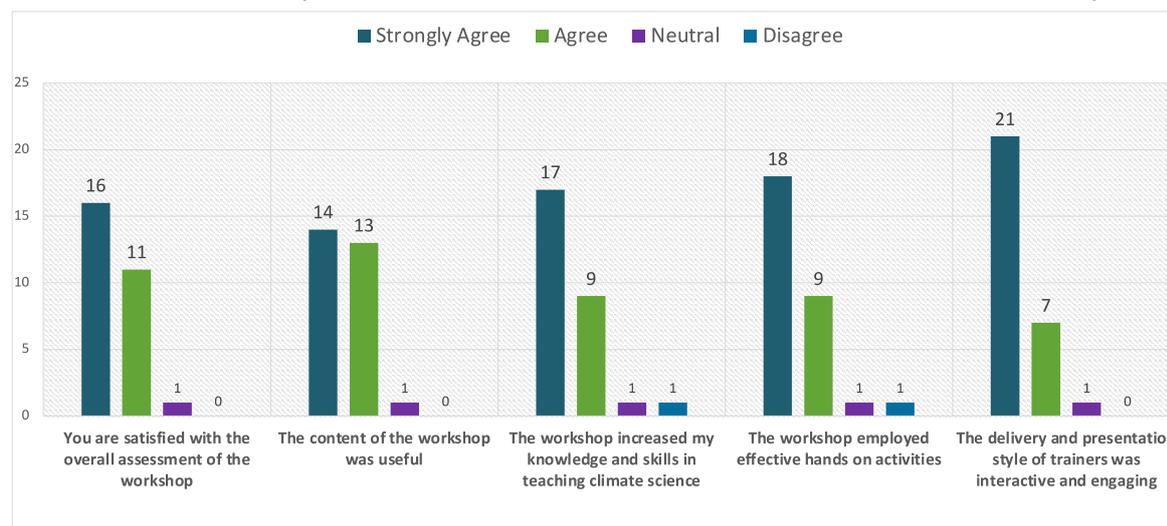
Major Outcomes of the Workshop

The Capacity Building Workshop for Science Teachers on Climate Change Education was a very good platform to produce teachers who have adequate competence and are skillful in engaging current students with latest issues on climate change. Besides teachers, participants from different background, had an opportunity to bring activities and small programs into their respective fields and this would include more stakeholders in taking Climate Change Education as important project. It is the first step towards this important initiative to bring Climate Change Education to the front of a country as vast and diverse as Pakistan.

During these intense five days of the workshop, participants learned about the impacts of climate change in Pakistan and the major concepts related to climate change: change, biosphere, greenhouse phenomena, impacts, mitigation, adaptation and Disaster Risk Reduction (DRR). Workshop also equipped science teachers to understand better on learning methodologies and enhanced their skills, knowledge and competency around climate literacy and discussed how to best integrate climate change in classroom.

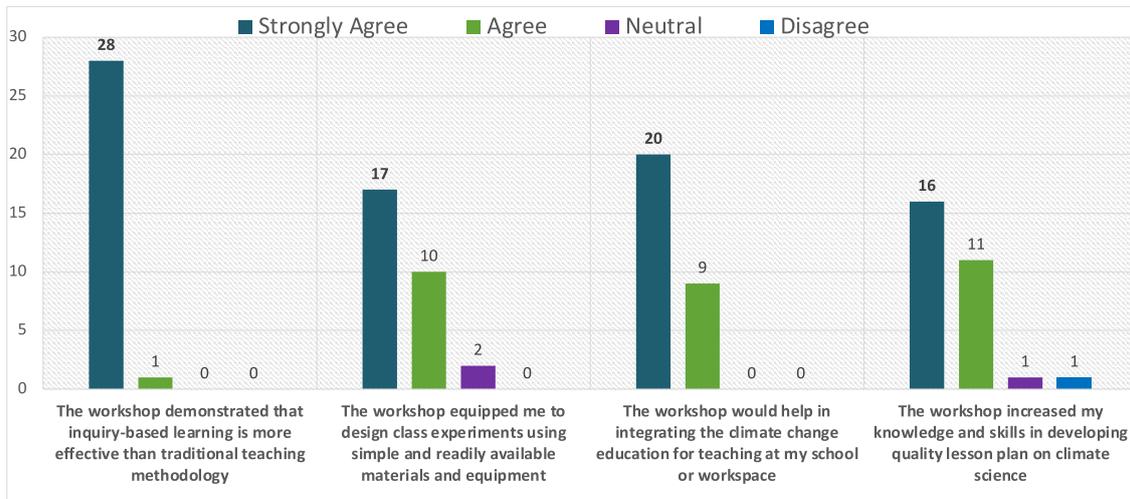
The thing that was most inspiring about this workshop was the high level of commitment to the workshop by the participants. It is worth mentioning, that this group of participants was the best that trainers have previously trained in an international workshop. Except for not more than two participants, everyone worked hard, shared ideas, created activities and presentation.

Post Workshop Evaluation – Feedback of the Participants



They showed maturity by trying to understand every idea and concept delivered by the trainers. Trainers hoped that this high spirit and commitment will continue into the Post Workshop Programme. At the end of the workshop, a short survey amongst participants was conducted to gauge the success

and effectiveness of this workshop. Majority of participants were satisfied with the learning outcome of the workshop.



Key Challenges

The biggest challenge for the trainers was to overcome issues on lack of basic pedagogical skills among the non-teachers and the new teachers. This was reflected mainly by the time required to complete activities and the experiments. It was also obvious when some participants couldn't properly design simple and basic experiment. Since the plan was to impart inquiry based learning, the trainers just provided some important clues for the participants to work on.

Time constraint due to some changes in the actual programme was also considered a challenge throughout the workshop. As the traffic condition around Islamabad became unpredictable and slightly affected the flow of some sessions. The trainers wished they had more time for the workshop! This reflects upon the basic knowledge and comprehension of the concept by the participants, mainly because climate change has not been part of teaching in mainstream schools in the country.

Finally, the time needed to reach consensus among group members during group activity was also a challenge. Groups seemed to having difficulties to finish the tasks on time. This is due mainly to different background and level of prior knowledge and perhaps a culture of taking time rather easy! They seemed to be very polite and understanding in listening and accepting group members' ideas and opinions and less forthcoming to question or argue for reasoning. Thus, it took them some extra time to come up with group answers.

Final Thoughts by the Trainers

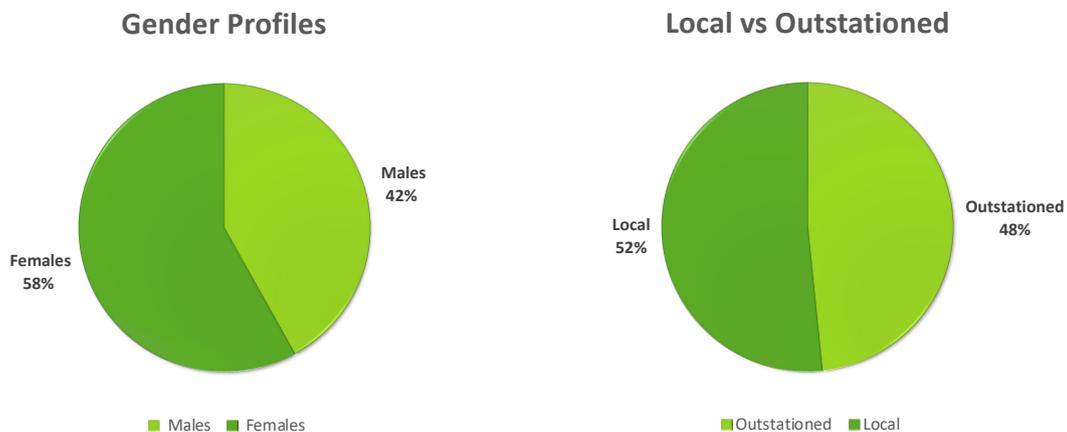
Rigorous selection process and the questionnaire managed to put together relatively good group of participants who were ever willing to learn. The best practice of the organizers was to have stringent selection criteria for a specific workshop. This was to ensure that the participants have enough background knowledge and skill to embark on a new training and benefit from it. In this workshop, though some were not teachers, but since they were the hardworking group of people, they showed

that with good attitude and commitment, you can learn almost anything. Trainers really enjoyed working with the participants.

With regards to shortlisting of participants, an online signup application form was developed, and the selection criteria was based on qualitative screening of candidates based on their responses to following three key questions:

-
- 1. Have you ever taught any science topic that highlighted Climate Change aspect to your students?**
 - 2. In your opinion what is the biggest climate change concern for Pakistan?**
 - 3. As a Science Teacher how can you contribute to the cause of Climate Change in Pakistan?**
-

Responses by the candidates demonstrated their prior understanding of climate change issues and their level of interest and willingness to be part of this training workshop.



Representation of Participants

A TOTAL OF 119 APPLICATIONS RECEIVED. OVER 40 SHORTLISTED AND 30 SCIENCE TEACHERS PARTICIPATED

Workshop organizers also ensured gender inclusivity and that the selected participants are enthusiastic and young science teachers and professionals from all provinces of Pakistan. A good number of participants were also from marginalized areas, where there are hardly any opportunities like these capacity building workshops, especially for science teachers.

Conclusion

The Capacity Building Workshop for Science Teachers on Climate Change Education was a very good platform to produce teachers who have adequate competence and are skillful in engaging current students with latest issues on climate change. Besides teachers, participants from different background, had an opportunity to bring activities and small programs into their respective fields and this would include more stakeholders in taking Climate Change Education as important project. It is the first step towards this important initiative to bring Climate Change Education to the front of a country as vast and diverse as Pakistan.

During these intense five days of the workshop, participants learned about the impacts of climate change in Pakistan and the major concepts related to climate change: change, biosphere, greenhouse phenomena, impacts, mitigation, adaptation and Disaster Risk Reduction (DRR). Workshop also equipped science teachers to understand better on learning methodologies and enhanced their skills, knowledge and competency around climate literacy and discussed how to best integrate climate change in classroom.

The workshop emphasized the need for mainstreaming climate science into school education and integrating climate change into school curriculum. Nevertheless, it should be recognized that a single workshop will not create a long-lasting impact, given the scale of education and climate emergency in Pakistan. Therefore, it requires serious and consistent efforts to replicate this workshop at much larger scale for widespread adoptability of climate science content at Pakistani schools. Given the scale of efforts needed to produce successful outcomes, it is extremely important for partners to work together, including ECOSF, Sukkur IBA University, UNESCO and Ministry of Federal Education and Professional Training (MoFEPT) as well as the provincial Education Departments, to create a sustainable impact by raising awareness, up-skilling and knowledge creation around climate change.

Endorsement by the trainers: *Strong support from the organizers made the training very relaxed and conducive. From preparing all the equipment and materials to taking very good care of the trainers, it is not much to say that this organizing team was the best to have worked with. They were there round the clock, providing all sort of assistance to the trainers and participants. They showed that they genuinely wanted the workshop to be a success. This gives us the trainers the strength and energy to continue guiding the participants in the Post Workshop program.*

