TROP ICSU: Trans-disciplinary Research Oriented Pedagogy for Improving Climate Studies and Understanding
(https://tropicsu.org)

Report on the TROP ICSU Workshop for Teachers at Thimphu, Bhutan,

organized in collaboration with

The Center for Disaster Risk Reduction and Community Development Studies (CDRR & CDS), College of Science and Technology, Royal University of Bhutan
and
The Commission on Education and Outreach, International Association of Seismology and Physics of the Earth's Interior (IASPEI)
(14-15 February 2019)

Workshop Title:	A Faculty Development Program cum Workshop on CLIMATE ACROSS THE CURRICULUM: EDUCATIONAL RESOURCES FOR TEACHERS
Date:	February 14-15, 2019
Venue:	Jambayang Resort, Thimphu, Bhutan
Facilitators from the TROP ICSU Team:	Dr. Rahul Chopra, Ms. Anita Nagarajan, Ms. Aparna Joshi
Facilitator(s) from CDRR & CDS, IASPEI:	Dr. Raju Sarkar
Team of Coordinators/Helpers from the College of Science and Technology, Royal University of Bhutan:	Ms. Karma Kelzang Eudon, Ms. Sonam Choden, Ms. Sangay Choden, Ms. Namgay Om, Mr. Pravakar Pradhan, Mr. Jeewan Gurung, Mr. Regden Tenzin, Mr. Bhawani Shankar, Mr. Basant Pradhan, Mr. Bharat Kumar Humagai, Mr. Tshewang Nidup, Mr. Om Kafley
Number of Participants:	66
Disciplines/Subjects Taught by Participants:	University Lecturers: Architecture, Civil Engineering, Mathematics High School Teachers: Dzongkha, Economics, English, Environmental Science, Geography, History, Mathematics, Science A detailed listing of the disciplines is provided in Appendix I: Disciplines/Subjects Taught by the Participants.

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Summary of the Workshops

A **2-day workshop for university lecturers and school teachers** was conducted in collaboration with the Center for Disaster Risk Reduction and Community Development Studies (CDRR &CDS), College of Science and Technology, Royal University of Bhutan and the Commission on Education and Outreach, International Association of Seismology and Physics of the Earth's Interior (IASPEI)—an association of the International Union of Geodesy and Geophysics (IUGG), which is a partner of the TROP ICSU project—at Thimphu, Bhutan, on February 14 and 15, 2019. The workshop was attended by 66 school teachers and university lecturers from Bhutan. The participants included a representative from the Young Earth System Scientists (YESS) community, the principal of a school, and the vice-principal of a school.

TROP ICSU is grateful for the tremendous support and help from the College of Science and Technology (CST), IASPEI, and the coordination team in planning and organizing all the logistics and arrangements, and in personally visiting schools to encourage teachers to participate in the workshop.

The objective of the workshop was *to introduce the participants to digital teaching resources for teaching topics in the Sciences, Mathematics, Social Sciences, and Humanities using climate-related examples, case studies, and activities*. In addition, participants would be invited *to review the educational resources of the TROP ICSU project and to provide their feedback on the appropriateness and ease-of-use of the teaching tools and lesson plans*.

Group Photo: Workshop for School Teachers and University Lecturers, Thimphu, Bhutan

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Group Photo: Facilitators and Coordination Team, Workshop for School Teachers and University Lecturers, Thimphu, Bhutan

The workshop commenced with an introduction to the College of Science and Technology, Royal University of Bhutan by Dr. Cheki Dorji, President of CST-RUB. Next, an overview of CDRR & CDS and its work, and an introduction to the work of the Commission on Education and Outreach, IASPEI, was provided. Then, participants attended a few plenary sessions for an overview of the TROP ICSU project and its teaching resources. Over the next one and a half days, the teachers/educators worked in groups to carry out hands-on, interactive activities by using various teaching tools and lesson plans from the TROP ICSU website. They provided review comments about the teaching resources (via online review forms) to help in further enhancing the quality and effectiveness of the content. Further, participants worked in discipline-based groups to develop new lesson plan ideas to teach topics in their discipline using climate-related examples. In these activities, participants engaged in peer-to-peer discussions and exchanged ideas. The workshop concluded with presentations on new lesson plan frameworks and ideas and an open discussion on continued engagement and collaboration with the TROP ICSU project.

TROP ICSU had also invited a member of its partner organization, the YESS community, to participate in the workshop. The Environmental Officer at the Center for Water, Climate Science and Environmental Policy, Ugyen Wangchuk Institute for Conservation and Environmental Research (UWICER), attended the workshop and participated in all the sessions. She also made a presentation on the work of UWICER, the mission and objectives of the YESS community, and climate-related topics and resources that are specific to Bhutan.

Plenary Session at the Workshop for Teachers, Thimphu, Bhutan

Plenary Session at the Workshop for Teachers, Thimphu, Bhutan

Overall, the participants were keen on learning about the usage of digital teaching resources in the classroom and to integrate climate science/climate change-related topics in their existing curriculum. They provided critical feedback on the existing teaching resources from the pedagogy perspective. Further, they actively participated in the creation of new lesson plans and specifically, in the generation of ideas that are relevant and specific to Bhutan. Each group created a framework for one new lesson plan for their discipline. Peer-to-peer discussions in groups enabled an exchange of several ideas and the development of new lesson plan frameworks.

Group Activity at the Workshop for Teachers, Thimphu, Bhutan

Group Activity at the Workshop for Teachers, Thimphu, Bhutan

Summary of the feedback received on the lesson plans from the TROP ICSU website

Explaining the topic(s) in the discipline: 100% of the responses from the university lecturers and **approximately 95%** of the responses from the high school teachers stated that the reviewed lesson plan was **very effective or moderately effective** in explaining the topic in the discipline.

Integrating the discipline topic(s) with climate science: 100% of the responses from the university lecturers and approximately **95%** of the responses from the high school teachers indicated that the reviewed lesson plan was **very effective or moderately effective** in integrating the discipline topic(s) with climate science.

Using the lesson plan in the classroom: 100% of the responses from the university lecturers and **100%** of the responses from the high school teachers indicated that they **would use the lesson plan in their classroom as is or with some modifications**.

Detailed results for the lesson plan reviews are provided in Appendix II A: Review of Lesson Plans by Participants (University Lecturers) and Appendix II B: Review of Lesson Plans by Participants (High School Teachers).

Summary of the feedback received on the teaching tools curated on the TROP ICSU website

Explaining the topic(s) in the discipline: 90% of the respondents among the university lecturers and **approximately 90%** of the respondents among the high school teachers thought that the reviewed tool was **very effective or moderately effective** in explaining the topic(s) in the discipline.

Describing the tool: 100% of the responses from the university lecturers and **approximately 97%** of the responses from the high school teachers stated that the **tool description adequately shows how the discipline topic can be taught using a climate-related example, activity, or case study**.

Using the tool in the classroom: 100% of the respondents among the university lecturers and **approximately 97%** of the respondents among the high school teachers indicated that they **would use the reviewed tool in their classroom as is or with some modifications**.

Detailed results for the teaching tool reviews are provided in Appendix III A: Review of Teaching Tools by Participants (University Lecturers) and Appendix III B: Review of Teaching Tools by Participants (High School Teachers).

Details of the Workshop

Agenda and Overall Organization

The agenda of the two-day workshop was as follows:

- **Day 1:**
  Presentations by the College of Science and Technology (CST) and IASPEI: Welcome remarks; introduction to CST, CDRR and CDS, and the Commission on Education and Outreach, IASPEI and their work; objectives of the workshop

  Presentations by the TROP ICSU team: Welcome remarks; introduction to the TROP ICSU project, overview and demonstration of teaching resources (teaching tools and lesson plans) by using examples from each discipline

  Group-based activity by the participants (groups organized by discipline): Review of discipline-specific teaching resources available on the TROP ICSU website (one lesson plan and one teaching tool per group); providing feedback on teaching resources through online review forms

  Open discussion on the review of teaching resources

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Group Activity at the Workshop for Teachers, Thimphu, Bhutan

- **Day 2:**
  Presentation by YESS community representative: Overview of the Ugyen Wangchuk Institute for Conservation and Environmental Research (UWICER) and its work; overview of the YESS community; and introduction to climate topics and resources specific to Bhutan

  Introduction to the components of a lesson plan

  Group-based activity by the participants (groups organized by discipline): Creation of a new lesson plan based on an idea that integrates a climate topic with their regular teaching

  Presentation of new lesson plans by participants: Brief summary of the lesson plan topic and tools/resources by each group

  Open discussions with participants: Feedback on the workshop and discussions on long-term engagement of participants with TROP ICSU

  Closing remarks

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Presentation of a Lesson Plan Idea at the Workshop for Teachers, Thimphu, Bhutan

Presentation of a Lesson Plan Idea at the Workshop for Teachers, Thimphu, Bhutan

Participant Feedback and Suggestions on Existing Teaching Resources

- Reduce the duration of a lesson plan
- Include more location-specific resources
- Include more resources in the “Additional Resources” section
- Add a follow-up activity such as a discussion or video at the end of a lesson plan

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Ideas for New Lesson Plans

Some of the new lesson plan ideas and frameworks created by the participants were on the following topics:

- Climate Change and Biodiversity, example of Bhutan's snow leopard population (Biological Sciences)
- Climate Change and the Economic Growth of Bhutan (Economics)
- Climate-Smart Agriculture in Bhutan (Economics)
- Bar Graph Interpretation by Using Infographics on Global Warming and Sea-level Rise (Mathematics)
- Climate Change and Building Design (Civil Engineering, Architecture)
- Learning About Functions and Variables by Using Rainfall Data (Mathematics)

Key Takeaways and Learnings from the Workshops

- From observations during the workshop, the key learnings for the teachers were: the use of digital pedagogy and the idea of using teaching resources that integrate climate topics with topics in their discipline.
- Participants found the hands-on, interactive group sessions to be very useful and engaging.
- Peer discussions in groups helped in the exchange of ideas and enhanced participants' learning.
- Participants sought local and region-specific examples (Bhutan) for their teaching; some of the lesson plan ideas generated during the workshop incorporated such examples.
- A majority of the participants indicated a strong preference for creating and using shorter lesson plans (duration of 50-60 minutes).
- Some feedback from participants:
  "*The session was helpful and effective. As a mathematics teacher our challenge is to infuse value in our lesson but after this session we ourself designed a lesson plan where we would be teaching mathematical concept with very important global issue infused in our lesson. Thank you"*

  "Very informative and an enriching experience."

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"It was very useful, thought provoking and relevant program. I have enjoyed all lectures, sessions and the workshop reminded me of the importance of the Climate change and the need to include it in our curriculum…"

"Didn't know earlier that climate change could be integrated to teach different disciplines. Will relate and use climate change information to teach different topics possible to make children more aware of climate change and its impact. Would like you look into the overall Bhutanese curriculum and suggested what are the possible climate change information that could be included or incorporated to teach different topics and where to find them."

"The teacher participants could be asked to come with a copy of the module descriptor they teach so that they could work with something that they can take back immediately to be used in the classroom."

Next Steps

- Engagement by Team TROP ICSU with the participants to further enhance/refine the lesson plan ideas created during the workshop
- Modification of existing teaching resources (content and layout) based on analysis of feedback from participants
- Addition of region-specific (Bhutan, Asia) case studies, activities, and resources by using the ideas generated during the workshop

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Appendix I: *Disciplines/Subjects Taught by the Participants*

University Lecturers:

Engineering Mathematics; Mathematics; Humanities; Research; Architecture, Urban Planning; Civil Engineering; Environmental Management; Engineering Chemistry and Environmental Science

High School Teachers:

Information and Communications Technology (ICT); Science; Social Studies; Mathematics; Biology; Geography; History; English; Commerce; Information Technology (IT); Dzongkha; Environmental Science; Physics

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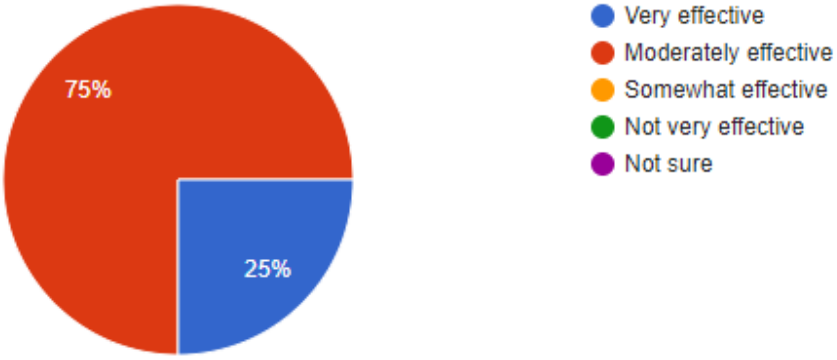
Appendix II A: *Review of Lesson Plans by Participants (University Lecturers)*

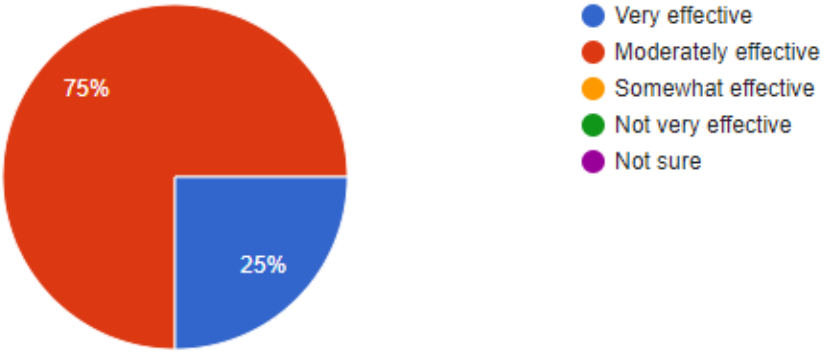
2. In your opinion, how effective is this lesson plan in explaining the topic(s) in the discipline?

4 responses



3. In your opinion, how effective is this lesson plan in integrating the discipline topic(s) with climate science?

4 responses



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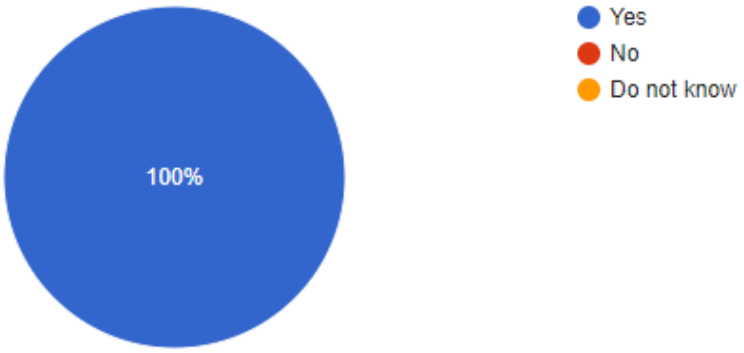
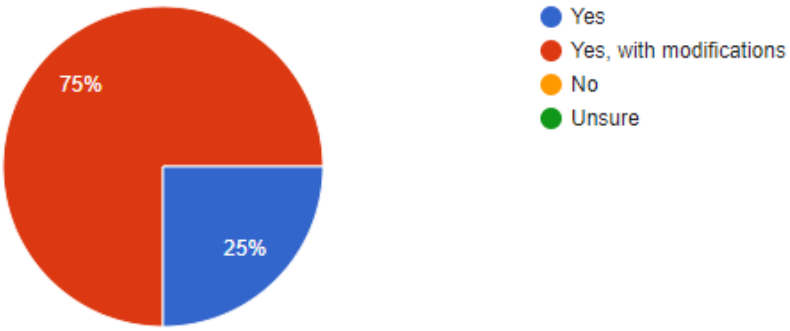
7. Do you think that your students will become more aware of climate change if you use this lesson plan in your classroom?

4 responses



8. Would you use this lesson plan in your classroom for your students?

4 responses



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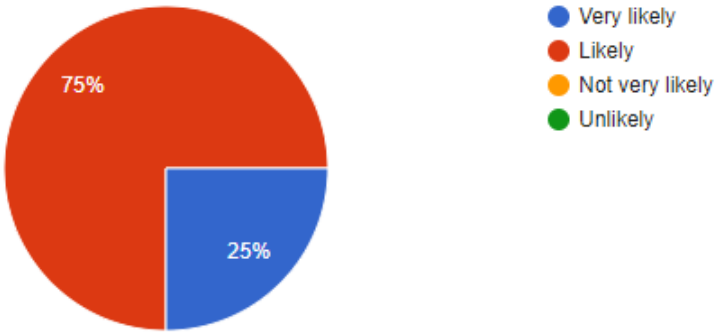
10. How likely are you to develop your own lesson plan that can enhance the understanding of a core topic in your discipline using a climate-related example, activity, or case study?

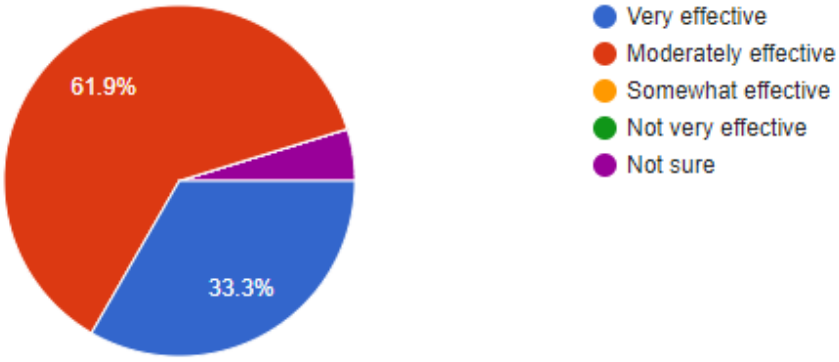
4 responses



Appendix II B: *Review of Lesson Plans by Participants (High School Teachers)*

2. In your opinion, how effective is this lesson plan in explaining the topic(s) in the discipline?

21 responses



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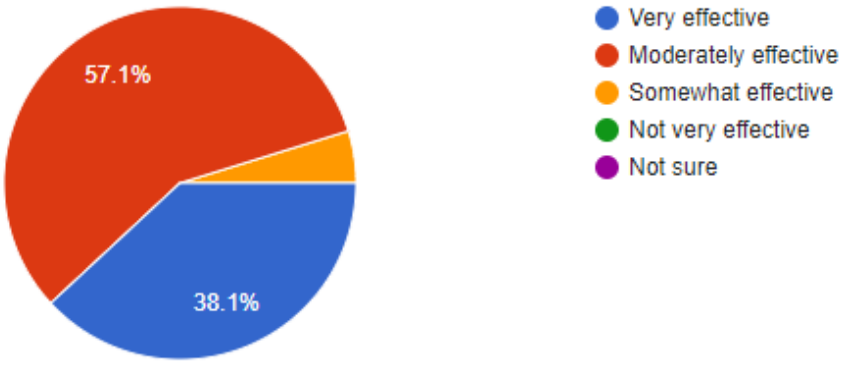
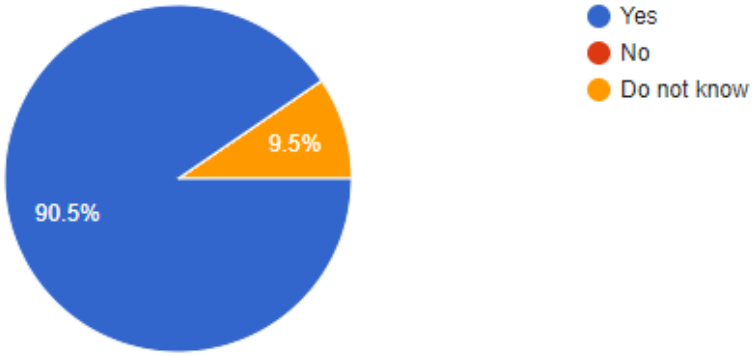
3. In your opinion, how effective is this lesson plan in integrating the discipline topic(s) with climate science?

21 responses



7. Do you think that your students will become more aware of climate change if you use this lesson plan in your classroom?

21 responses



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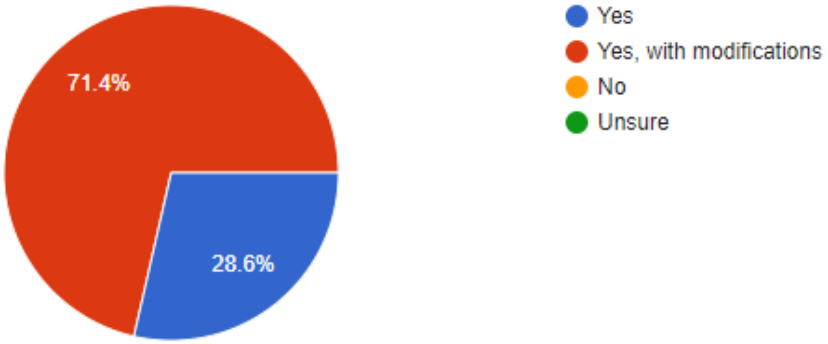
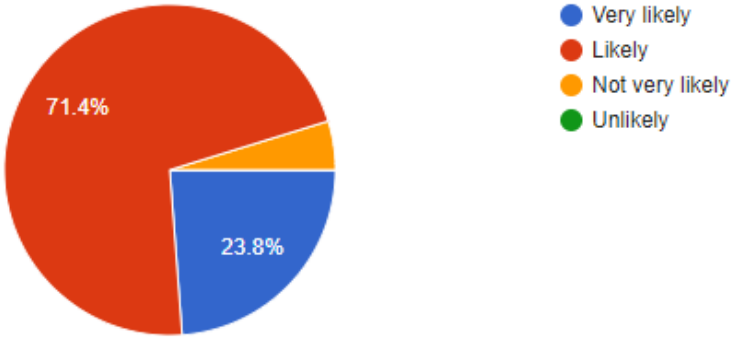
8. Would you use this lesson plan in your classroom for your students?

21 responses



10. How likely are you to develop your own lesson plan that can enhance the understanding of a core topic in your discipline using a climate-related example, activity, or case study?

21 responses



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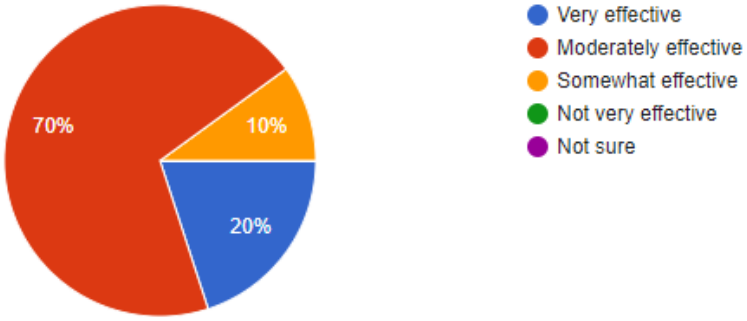
Appendix III A: *Review of Teaching Tools by Participants (University Lecturers)*

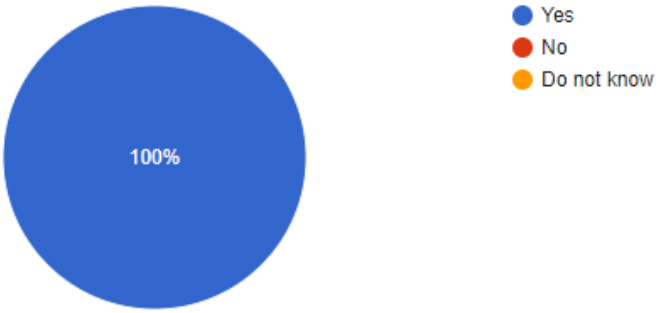
2. In your opinion, how effective is this teaching tool in explaining the topic(s) in the discipline?

10 responses



4. Does the tool description adequately show how the discipline topic can be taught using a climate-related example, activity, or case study?

10 responses



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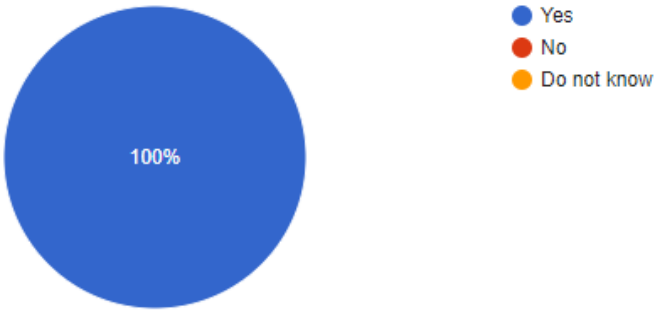
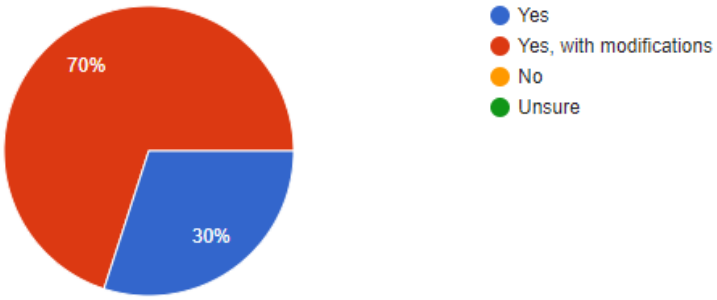
5. Do you think that your students will become more aware of climate change if you use this teaching tool in your classroom?

10 responses



6. Would you use this teaching tool in your classroom for your students?

10 responses



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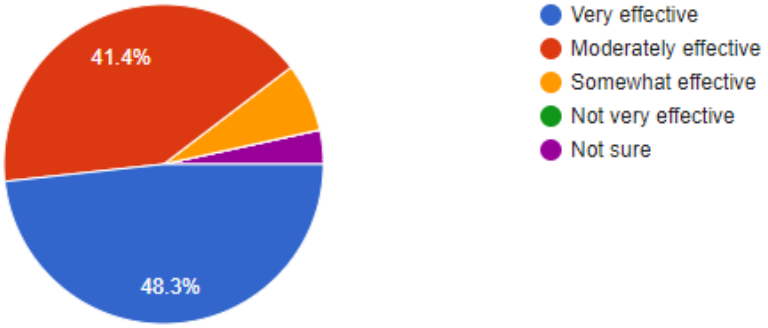
Appendix III B: *Review of Teaching Tools by Participants (High School Teachers)*

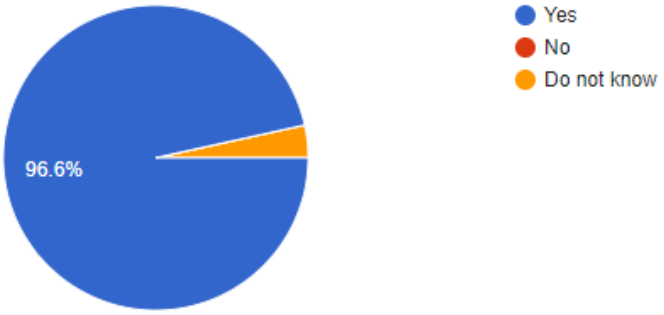
2. In your opinion, how effective is this teaching tool in explaining the topic(s) in the discipline?

29 responses



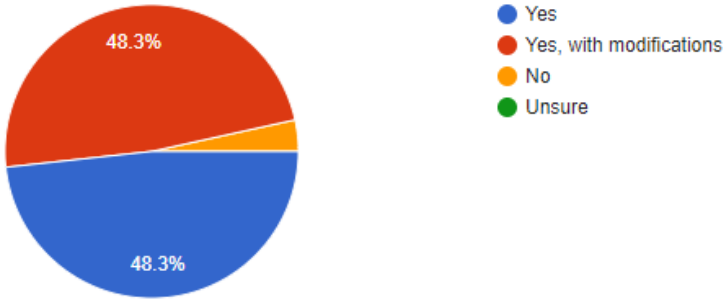
4. Does the tool description adequately show how the discipline topic can be taught using a climate-related example, activity, or case study?

29 responses



6. Would you use this teaching tool in your classroom for your students?

29 responses



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