

INTERNATIONAL UNION OF GEOLOGICAL SCIENCES (IUGS)

Reporting Form for IUGS Affiliated Organizations 2015

Reporting Organization : International Geoscience Education Organisation (IGEO) (registered in Bengaluru, India, in 2015)

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1. Overall Objectives

IGEO aims to promote geoscience education at all levels, to work for the enhancement of quality in the international provision of geoscience education and to encourage all developments that raise public awareness of the geosciences, in particular among young students.

2. Relate Goals to overall IUGS Scientific Objectives

IUGS gives special consideration to geoscience education, which is the overall objective of IGEO.

3. Structure and Organization

IGEO's Senior Officers are elected every four years by the International Council during the quadrennial International Conference of Geoscience Education (GeoSciEd conference).

The Council currently consists of members from 36 countries (full details at: http://www.igeoscienced.org/?page_id=22). Council meetings are held every two years, alternating between the GeoSciEd conference and the International Geological Congress (IGC). The next meeting will be during the 35th IGC (August 27-September 4, 2016, Cape Town, South Africa).

IGEO's Chair is *ex officio* Chair of the Advisory Board of the International Earth Science Olympiad (IESO), which is IGEO's flagship activity. IESO has its own organisational structure which was described in detail in the annual report for 2012 to IUGS.

4. Interaction with other International Organizations and Projects

IGEO closely relates to the Commission on Geoscience Education, Training and Technology Transfer (IUGS-COGE). IGEO's GeoSciEd conference provides every four years a platform for members of all international organizations concerned with or interested in geoscience education at all levels (from kindergarten to university), to present and discuss their activities. Furthermore, teachers, geoscience educators, pupils and officials of ministries for education from all over the world are involved in the annual IESO, where pupils, about 18 years of age from across the globe, compete using their geoscience competencies.

Recently, agreements were signed for Collaboration with International Association for Promoting Geoethics (IAPG) in May 2015 and with the International Association for Geoethics (IAGETH) in June 2015 to mutually promote the activities and further the goals of the organisations.

5. Chief Products

- *The International Conference on Geoscience Education (GeoSciEd) :*

IGEO's quadrennial "GeoSciEd" conference provides a forum for members of all international organizations concerned with or interested in geoscience education at all levels to present and discuss their activities. It is the most appropriate forum for exchanging ideas, sharing experiences and forging collaborations among participating teachers/geoscientists. The next conference, GeoSciEd VIII, is planned for Brazil in 2018.

- *The International Earth Science Olympiad (IESO):*

During IESO, gifted secondary / high school students from the world over come together. The students have previously been selected at the national level and, along with guest students if any, are accompanied by mentors and observers. The International Jury, consisting of mentors and observers who are essentially teachers, geoscientists or geoscience educators from the participating countries, discuss and finalise question papers for the written and practical tests. IESO also offers the prospect to discuss different approaches to geoscience education throughout the world. Thus, IESO is a unique opportunity to identify best practices/ approaches from around the globe. Something unique about IESO (and something special that sets IESO apart from all other international science olympiads) is the International Field Team Investigation in which mixed groups of students (of different nationalities, diverse cultures and varied backgrounds) work as teams in a friendly and co-operative (as against competitive) manner on a topic both outdoors and indoors and prepare a PowerPoint presentation. In the 7th edition of IESO in India, a new activity called the 'Earth System Project' was initiated. The topic was the Indian Monsoon. Both these items of activity have been a run-away success.

- *Educational Session/s during the International Geological Congress, every four years.*

Sessions specifically dealing with geoscience education (at different levels and with different perspectives) are convened during the International Geological Congress (IGC) held every four years. A number of IGEO members have been chosen to act as 'Theme Champions' to promote and coordinate sessions and workshops at the forthcoming 35th IGC in Cape Town in August 2016 as part of the 'Geoscience in Society' theme. Abstracts are currently being submitted and workshops planned. The IGC presentations and workshops have been critical to the promotion of geoscience education in the past, and there is every reason to hope for this to continue at Cape Town.

International Syllabus on Earth Science Education and plan for accompanying textbook

The recommended minimum syllabus requirement for school-level Earth science education was published on the IGEO and IUGS-COGE websites at the beginning of last year. This followed a survey of the content of national syllabi and an exercise to ensure that the major content of syllabi across the world was covered by the international syllabus. An article on the development of the international syllabus, including a copy of the syllabus itself, appeared as: King, C. (2015) The international geoscience school syllabus and its development. *Episodes International Journal of Geoscience*, 38.1, 57-74.

A workshop is planned for the IGC in Cape Town in August 2016 to plan the development of an international geoscience textbook to support the International Syllabus.

- *Earth Learning Ideas (ELI)*

The Earthlearningidea website continues to publish a new idea for the teaching of Earth science every two weeks. To date (December 2015), 224 ideas have been published in English and there are more than 600 translations of these activities on the website (or linked to the website) in Spanish, Catalan, Norwegian, Italian, German, Portuguese, Polish, Chinese (Mandarin), South Korean and Tamil. The activities are currently being downloaded at a rate of more than 50,000 per month, giving more than 2.25 million downloads in all. The Earthlearningidea blog has now been accessed in more than 9500 towns and cities of 198 countries across the world. Fifty more activities are already in the pipeline for publication next year and beyond.

- *Teacher Training Workshops:*

Earth science, unfortunately, is neither a separate subject of study nor is it comprehensively represented in the school curriculum of many countries. Teachers from the Arts, and not the Science stream, often teach earth science topics in schools in the form of lectures and without any hands-on and mind-on activities. That school teachers are not formally trained in the teaching of earth sciences is a glaring omission, covering both the aspects of content knowledge and interactive teaching skills (for example, using the laboratory, outdoors and computer learning environments) that form the heart of earth science education.

In the light of the above, the way earth science is taught in many schools needs a radical shift from classroom lectures to field work and hands-on activities, observations and deduction. This challenge can only be met by the systematic professional development of teachers. The objective of the workshops should be to provide teacher participants with practical teaching and learning strategies and techniques. The participants should experience active learning in the lab, outdoor and classroom learning environments with learning materials (worksheets and activities) that can readily be implemented in their schools.

Such workshops are available and are proving very effective in some countries. Workshops using these approaches were piloted in India in 2015, as reported below.

- *Public relations activities and communication strategies within the IGEO/IESO membership*

Senior Officers, Council members and members of the IESO community have been publicising IGEO and IESO whenever and wherever they attend meetings/ conferences etc. The official website of IGEO (<http://www.igeosied.org>) has been upgraded and with new interactive features provides a more dynamic platform for members to collaborate. The IESO website (<http://www.ieso-info.org/>) also provides useful information to the geosciences community. Besides, IGEO periodically publishes its newsletter which contains not only IGEO and IESO matters but also forthcoming events pertaining to geoscience education, educational resources, reports on geoscience education-related activities. The Newsletter is published on the IGEO website. Activity on the IGEO official Facebook site has risen considerably over the past 12 months, with over 2,000 likes, averaging 24 per week.

6. Chief Accomplishments 2015 and Plans for 2016 - 2018

6.1. Chief Accomplishments 2015

Teacher Training Workshops in India and Brazil

The International Geoscience Education Organisation organised three Teacher Training Workshops in Goa, Mangaluru and Bengaluru during July 2-5, July 7-10 and July 12-15, 2015 jointly with the National Centre for Antarctic and Ocean Research, St. Aloysius College (Autonomous) and the Karnataka State Council for Science and Technology, which were attended by 17, 48 and 63 high school teachers respectively. These were organised as a pilot project to test the impact of such an approach in an Indian setting. The workshops were conducted by Prof Chris King (UK) and Prof Nir Orion (Israel).

'Teaching the dynamic Earth' workshops – Professor Chris King

The 'teaching the dynamic Earth' series of workshops involved a range of hands-on, practical activities during which the participants were invited to test the different activities and feedback on their educational value and practicability for teaching in Indian classrooms. Each workshop activity was designed to teach Earth science knowledge and understanding whilst developing critical thinking skills in both participants and the school pupils they teach.

Each of the workshops was self-contained a free-standing experience often with starter and plenary activities based on a workshop booklet, a PowerPoint introduction and a range of hands on activities using readily available materials.

Participants were introduced to the Earthlearningidea website (at: <http://www.earthlearningidea.com>) that contains a wide range of Earth science-related activities specially designed for teaching in classrooms with minimal resources, and to the virtual rock kit at: http://www.earthscienceeducation.com/virtual_rock_kit/DOUBLE%20CLICK%20TO%20START.htm to help them to remember the range of rock types they had met during the workshops.

The Rock Cycle and Earth Systems – Professor Nir Orion

The teachers received an inquiry-based booklet (Appendix 1) that included activities from the "Thinking Science – Understanding Environment" (TSUE) - an Earth Systems Approach (ESA) program for middle and high school levels. After photos of the local environment of each of the workshops had been emailed to Prof. Orion in advance, he designed the booklet to follow the local rock cycle story and developed three different short outdoor activities for the Goa workshop (Appendix 1), the Mangalore workshop (Appendix 2) and Bangalore (Appendix 3). The main objectives of these short outdoor activities were for participants to make observations and raise questions concerning the local earth systems phenomena, together with the taking of samples. The teachers' authentic questions initiated the indoor learning sequence and during the indoor sequence they explored their own authentic samples.

The indoor inquiry-based learning involved a very rich material and equipment-based learning environment which is available (or should be available) in schools (e.g. beakers, test tubes, cylinders, slides, spirit heaters, rock and mineral kits, microscopes, binocular microscopes, sands, soils, ice, Plasticine (modelling clay), etc.).

The workshop started with a short introduction followed by 2.5-hour (including driving time) outdoor activity in the local environment (10-30 minutes driving from the workshop base). The remaining 1.5 days was conducted in a room that was laid out for team learning of 4-6 heterogeneous teams of no more than five participants. Each team worked cooperatively, as directed by the inquiry-based worksheet and the teacher moved between the teams and reacted to questions and comments. Each part of the workshop started and was closed by a whole class

short sessions (introduction and summary).

The participants of all the three workshops expressed a remarkable enthusiasm during their learning. This involved deep discussion of the activities between them and a lot of questions being prompted. They took only short breaks and some of them even skipped some of the breaks in their enthusiastic response to the approach.

In Brazil, Prof. Nir Orion conducted a teacher training course titled THE ROCK CYCLE AND THE EARTH SYSTEM at the University of Campinas, September 9-10, 2015.

Prof Roberto Greco conducted workshops for secondary schools teachers and future teachers in Brazil to spread Earth Learning Idea initiative: 02/03/2015 at Rio de Janeiro, 05/11/2015 at Parantins (Amazonia), and 09/11/2015, Manaus (Amazonia).

9th International Earth Science Olympiad (IESO), Pocos de Caldas, Brazil

The 9th IESO, organized by the Federal Institute for Education, Science and Technology of South of Minas (IFSULDEMINAS) during 13-20 September, 2015 in Poços de Caldas, State of Minas Gerais (<http://ieso2015.ifsuldeminas.edu.br>) was attended by 85 students, 6 guest students, 43 mentors and 37 observers, from 27 countries (22 of them with full teams).

While IFSULDEMINAS took care of the logistics, the scientific aspects were looked into by the Scientific Committee comprising professors from IFSULDEMINAS and professionals from other institutions like Unicamp, USP, UNIFAL, Embrapa, UFRRJ, UFRJ, UFJF and UNIFEI. Several Brazilian institutions get involved in the scientific committee to prepare written and practical test as well the cooperative task.

Poços de Caldas is located inside a volcanic caldera about 30 km across. The border of the caldera is still visible, being a few hundred meters higher than the surrounding area.

The international teams were received at São Paulo airport on September 13 and were brought to Poços de Caldas. After dinner, the students got the first opportunity to socialize, presenting themselves and their country.

The 9th IESO was inaugurated on September 14, in the main hall of the Casino building with all the delegates in formal or traditional attire. Besides the customary speeches, the ceremony offered a glimpse of local Brazilians dances.

The students were engaged in written and practical tests. This year, for the first time, the written exam question paper was vetted by an international examination board nominated by the IGEO Chair.

For the practical test, students carried out field work to understand the type of rocks, the relationships amongst them and analyze which of the earth system processes they could recognize in the place; other practical tests related to the Earth's rotation, hydrology and meteorological conditions.

In the International Team Field Investigation, mixed groups of students investigated one of the following themes and prepared later on a PowerPoint presentation: Local rock formations, the local geothermal phenomenon as well as local soils.

The theme of Earth System Project for this year was "El Niño and its interrelationship with the Earth system". Again, mixed groups of students made accessed the Internet to gather data and information. The output of this work was poster presentation which was assessed by an international jury.

Students enjoyed a lot working together, collaborating in a constructive way, preparing posters and presenting their works and findings of excellent quality.

Meanwhile, mentors and observers were mainly occupied in the International Jury meeting to assess and translate the question papers for the tests and discuss future editions of IESO. They visited the local agriculture schools and got information about local crops, interaction of basalts with tropical climate which produced the red soil which supports the growth of coffee.

As usual all the delegates, students, mentors and observers visited local schools where they interacted with students and teachers.

The Awards Ceremony was held on September 20 in the Casino Hall. Based on their performance in the tests, students received gold, silver and bronze medals (10%, 20% and 30% respectively of the total number of students). The students received bronze medals from Deputy Mayor of Poços de Caldas, Nizar El-Kathib, and the Embrapa researcher, Alfredo Barreto Luiz, silver medals from the Under Secretary of Higher Education of the State of Minas Gerais, Márcio Rosa Portes, and General Coordinator of Planning and Management of the Federal Network, Nilton Nelio Cometti and gold medals from Marcelo Bregagnoli and the Chair of IGEO, Rajasekhariah Shankar. Best groups in the International Team Field Investigation and Earth System Project were awarded with gold, silver and bronze medals as well. The highest score was made by the South Korean student, Seung Wong Jung.

Three best performing countries, Taiwan, South Korea and Indonesia, received typical artisanal handcraft of Poços de Caldas. At the end of the ceremony, the responsibility of organizing the IESO was handed over by Brazil to Japan that will host the next edition. This was symbolized by handing over a musical instrument called "maraca" that is typical of Native American culture.

Preparations for the 10th IESO (Mie, Japan)

The 10th edition will be organised by the Japan Earth Science Olympiad Committee in collaboration with Japan Geoscience Union, Mie Prefecture, Mie University and the Japan Science and Technology Agency, during August 20-27, 2016 (<http://ieso2016.jp>)

Preparations for future editions of IESO

- 10th IESO, 2016, Japan. Contact: Kenichiro Hisada (hisadak@geol.tsukuba.ac.jp)
- 11th IESO, 2017. This slot is open but serious efforts are being made by three countries to grab the opportunity of organising the 11th edition.
- 12th IESO, 2018, Thailand.
- 13th IESO, 2019, S. Korea has made a representation to hold the event.

Earth Sciences Exhibition

The IGEO organised an EARTH SCIENCE EXHIBITION jointly with the Government Science College, Bengaluru during July 12-16, 2015. The objective was to popularise Earth Sciences and kindle interest in this discipline among school and college students and the general public.

Breath-taking specimens of minerals, crystals, fossils, dinosaur eggs, dinosaur teeth etc. were on display. These specimens are from the wonderful collection of Mr. M F Makki from Pune.

About 10,000 people, comprising school/ college/ university students and teachers, engineers, doctors, nurses, engineers etc., visited the exhibition. Student volunteers explained the various exhibits and answered queries from visitors.

IGEO hoped that this exhibition would ignite young minds and draw them to pursue higher studies and careers in Earth Sciences at a time when interest in science in general is waning. This would also help educate the common people about the importance of Earth Sciences and to help them become responsible citizens of the world.

Feedback from viewers :

Blank.... No words to describe, true beyond what words can explain. And ever think of selling ... don't forget me, I will buy all of them. I am serious, all of them. – Asra Zulfiquar.

Man, that was amazing. Never been so curious!!! – Shreya, R.

Really interesting. Very knowledgeable. Good interaction from your students. Keep it up. – Praveen Kumar.

Very good and very interesting to know about rocks and minerals on earth. It was very exciting to see the wonder inside rocks. Excellent team. – Asha, N.

Wonderful exhibition. Real good effort from the team to explain to laymen like us. All the best!!! – Srinivas, N. A.

Very well exhibited; explanation was very good; all in all very informative for students. – Deepa.

Best thing I have ever seen. – Srikar.

International Syllabus on Earth Science Education and plan for accompanying textbook

A workshop is being planned for the 35th IGC in Cape Town in 2016 to develop an international textbook to support the International Syllabus. The form of the textbook will be determined by workshop participants, based on innovative approaches for making the textbook available for the widest possible audiences. Innovative approaches being discussed include:

- Writing a 'skeleton' textbook in English to cover all the main topics of the International Geoscience Syllabus, explaining them using accessible text and diagrams
- Having the diagrams drawn to a commercial standard
- Encouraging the 'skeleton' textbook to be taken by IGEO members and others, and developed into a full textbook for their own country, region or city using their own examples with local/regional photographs
- This should allow the development of many textbooks from the one skeleton, such as:
 - International Geoscience Textbook for India – in English or local Indian languages
 - International Geoscience Textbook for Malawi – in English or Chichewa
 - International Geoscience Textbook for Bavaria, Germany – in German
 - International Geoscience Textbook for Catalonia, Spain – in Catalan
 - International Geoscience Textbook for Colorado, USA – in American English
 - International Geoscience Textbook for Sao Paulo – in Brazilian Portuguese
 - International Geoscience Textbook for Cape Town
 - International Geoscience Textbook for Bristol
 - Etc. – any language, any country, region or city where someone is willing to add the local examples and, if necessary, to do the translation
- Keying the different sections of the textbook into a separate document highlighting appropriate teaching activities, such as Earthlearningideas; the separate document can then be regularly updated as new teaching activities/strategies/materials become available

- The textbook will be published on a website (eg. IUGS or IGEO websites) as free-of-charge pdf download
- Retaining the copyright by IGEO for free educational (non-commercial) use (thus all photographs used in any version would need to be copyright-free)

My Earth science educator story –What I did, why I did it and what happened

This initiative will be launched on the IGEO website in the next few days (December 2015) though what we are calling 'Our International Year of Earth Science Educator stories'. The 'Introduction, rationale and guidance' document carries the following:

'Introduction and rationale

Many Earth science educators are doing excellent and sometimes truly amazing jobs across the world, but not only is this not generally known, but eventually all this good work, wisdom and enthusiasm will be lost, if we can't find a way of passing these on to the next generation.

The 'My Earth science educator story' project has been instigated to encourage experienced Earth science educators to write up their stories specifically to inform and inspire the next generation. In this context, anybody who feels that they have contributed something to Earth science education is regarded as an 'Earth science educator'.

The stories will be published at regular intervals on the International Geoscience Education Organisation (IGEO) website, and should build up over time into a compendium of wisdom, advice and experience that should provide fascinating insights into our world of Earth science education.

Please contact the project coordinator, Chris King, if you would like to contribute a story or you would like to nominate a friend or colleague to do so.'

More than 50 prominent Earth science educators have offered their stories so far, allowing these to be published at weekly intervals during 2016 at: http://www.igeosci.org/?page_id=396.

Public relations activities and communication strategies within the IGEO/IESO membership

Senior Officers, Council members and members of the IESO community have been publicising IGEO and IESO whenever and wherever they attend meetings/ conferences etc. The official website of IGEO has been upgraded and with new interactive features provides a more dynamic platform for members to collaborate. The IESO website also provides useful information to the geoscience community. Besides, IGEO periodically publishes its newsletter which contains not only IGEO and IESO matters but also forthcoming events pertaining to geoscience education, educational resources, reports on geosciences education-related activities. The Newsletter is published on the IGEO website. Activity on the IGEO official Facebook site has risen considerably over the past 12 months, with over 2,000 likes, averaging 24 per week.

Facebook: (<http://www.facebook.com/pages/International-Geoscience-Education-organisation/126146467450938>).

6.2 Internal Communication Platform

The newly established IESO Examination Board was successful in discussing and finalising the question paper for the IESO-2015 solely through email communication among the members. Senior Officers, as earlier, have been having email meetings to discuss issues relating to IGEO's activities.

7. Specify how any IUGS Allocation for 2015 was used.

IUGS kindly made available a grant of USD 4000 (= 3504.61 Euros) to IGEO, which we most gratefully acknowledge. Details of how it was spent are shown in the table below:

Item	Received (Euros)	Spent (Euros)
Grant received from IUGS for 2015	3504.61 *	
Grants provided to teachers from Third World countries to participate in the 9 th International Earth Science Olympiad, September 2015, Pocos de Caldas, Brazil:		
Saca Oscar, Bolivia		515
Ian McKay, S. Africa		1054
Yvonne Chasukwa Mwalwenje, Malawi		1950
Bank transfer fee (Malawi)		30
TOTAL	3504.61	3549
Deficit	44.39	
	3549	3549

* (Equivalent of USD 4000 received by IGEO)

8. Budget Request with Justification for 2016 (only applicable to low income affiliates)

While thanking IUGS for its financial support to and patronage of IGEO, we request for IUGS grants for the following three important activities:

- International Earth Science Olympiad (IESO)

The International Earth Science Olympiad (IESO) invites national teams (4 students under 18 years of age accompanied by two mentors) to present their Earth Science knowledge and compete with teams from all over the world. During this event, students also forge new friendships that may last for their entire lives, while their mentors and guests (teachers, geoscientists, geoscience educators, geoscientists from the ministries for education) discuss the tasks and identify best practices of geoscience education in various countries as well as modes of improvement. Again, teams from nations with poor financial background are not able to join the Olympiad and reap the benefits. For the IESO 2016 in Japan, we request generous funds from the IUGS to support the participation of at least four national teams from countries with poor financial background, giving preference to countries that will debut in IESO. This would stimulate more new countries to participate in IESO.

Request: 15000 USD

- Teacher Training Workshops

Following the success of the workshops in India during 2015, IGEO plans to continue this activity during 2016 in two other cities in India and in Sri Lanka. Through this, teachers would be exposed to field activities and hands-on activities using locally available materials in the teaching of earth sciences in schools. Such interventions in teaching-learning endeavours would help geoscience education in schools.

Request: 5000 USD

- International Conference on Geoscience Education (GeoSciEd)

The International Conference on Geoscience Education (GeoSciEd) reaches out to the international community of researchers in geosciences, researchers in geoscience education as well as teachers of various geosciences-related subjects. Together, they present and develop new ideas that help improve the quality of geoscience teaching across the world. They also collect and discuss ideas and strategies for geoscience outreach activities. The 9th GeoSciEd will take place in Brazil.

Request: 5000 USD

- International Geological Congress, Cape Town

IGEO will be organizing symposia at the IGC in Cape Town on the theme of Geoscience Education. Many Senior Officers of IGEO have been identified as 'Theme Champions' to publicise and promote the theme during IGC. Besides, Chris King will be running a workshop on the 'Development of an International Textbook to support the IGEO/IUGS-COGE International Syllabus'.

- Plan to support the 'Development of an International Textbook to support the IGEO/IUGS-COGE International Syllabus'

This evolving plan has two elements seeking IUGS support:

- Enabling those geoscience educators who have a track record in translating teaching materials into their own languages on a voluntary basis, to attend the international textbook development workshop at the International Geological Congress in Cape Town – 6 people @ USD 1250 per person = USD 7500
- The commercial redrawing of diagrams for publication in the suite of international geoscience textbooks – 350 diagrams @ USD 30 per diagram = USD 10500

Request: 18000 USD

9. Does your website have a link to IUGS?

Yes.