9th International Earth Science Olympiad

13th to 20th September, 2015

IESO2015

Poços de Caldas, Minas Gerais, **BRAZIL**

FINAL REPORT

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Marcelo Bregagnoli (Org.)

Final Report

INSTITUTO FEDERAL
Sul de Minas Gerais

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International Earth Science Olympiad 2015 Final Report

INDEX

Cap.1
International Geoscience Education Organization (IGEO)

IGEO History

Chris King, Emeritus Professor of Earth Science Education, Keele University

The evolution of:

- **Geoscience Education (GeoSciEd) conferences**
- **the International Geoscience Education Organisation (IGEO)**
- **the International Earth Science Olympiad (IESO)**
- **the International Union of Geological Sciences (IUGS) Commission on Geoscience Education and Technology Transfer (COGE)**
- **International Geoscience Education Organisation (IGEO) teacher workshops**

Summary

The sections below comprise:
- a timeline of GeoSciEd conferences, IGEO and IESO meetings and development
- a GeoSciEd conference section
- an International Geoscience Education Organisation (IGEO) section
- an International Earth Science Olympiad (IESO) section
- an International Union of Geological Sciences (IUGS) Commission on Geoscience Education and Technology Transfer (COGE) section

Timeline

1990	International Union of Geological Sciences (IUGS) Commission on Geoscience Education and Training (COGEOED)
1993	International Conference on Geoscience Education and Training, Southampton, UK
1994	
1995	
1996	Publication of GEOSCIENCE EDUCATION & TRAINING, Stow & McCall (eds) proceedings of the First Conference, Balkema Publ., 855p.
1997	GeoSciEd II, Hilo, Hawaii, USA International geoscience education association development committee formed, Hilo, Hawaii, USA
1998	
1999	
2000	GeoSciEd III, Sydney, Australia Internal Geoscience Education Organisation (IGEO) formed; first General Meeting, Sydney, Australia First IGEO Council meeting, Sydney, Australia
2001	
2002	

2003	GeoSciEd IV, Calgary, Canada Second IGEO General meeting, Calgary, Canada Second IGEO Council meeting, Calgary, Canada
2004	32nd International Geological Congress (IGC), Florence, Italy, IGEO organisation of three themes (school, higher and outreach education) Third IGEO Council meeting, Florence, Italy Formation of the International Union of Geological Sciences (IUGS) Commission on Geoscience Education and Technology Transfer (COGE), Boulder Colorado, USA
2005	
2006	GeoSciEd V, Bayreuth, Germany Third IGEO General meeting, Bayreuth, Germany Fourth IGEO Council meeting, Bayreuth, Germany
2007	1st International Earth Science Olympiad, Daegu and Youngwol,, Korea.
2008	33rd International Geological Congress (IGC), Oslo, Norway, IGEO organisation of an education theme Fifth IGEO Council meeting, Oslo, Norway Meeting of members of the International Union of Geological Sciences (IUGS) Commission on Geoscience Education and Technology Transfer (COGE)), Oslo, Norway 2nd International Earth Science Olympiad, Manila and Bicol, the Philippines
2009	3rd International Earth Science Olympiad, Taipei, Taiwan IGEO supported the International Conference for Global Development (GeoDev), Dhaka, Bangladesh
2010	GeoSciEd VI, Johannesburg, South Africa Fourth IGEO General meeting, Johannesburg, South Africa Sixth IGEO Council meeting, Johannesburg, South Africa 4th International Earth Science Olympiad, Yogyakarta, Indonesia IGEO supported the Joint Assembly of Geoscience Organisations in the Americas, Iguassu Falls, Brazil
2011	5th International Earth Science Olympiad, Modena, Italy
2012	34th International Geological Congress (IGC), Brisbane, Australia, IGEO involvement in two themes 1.2 Geoscience education and 2.3 Developing geoscience education and awareness for the benefit of society Seventh IGEO Council meeting, Brisbane, Australia IUGS-COGE Commission meeting Brisbane, Australia 6th International Earth Science Olympiad, Olavarria, Argentina
2013	7th International Earth Science Olympiad, Mysore, India
2014	GeoSciEd VII, Hyderabad, India Fifth IGEO General meeting, Hyderabad, India Eighth IGEO Council meeting, Hyderabad, India 8th International Earth Science Olympiad, Santander, Spain
2015	9th International Earth Science Olympiad, Pocos de Caldas, Brazil Teacher Training Workshops, in Goa, Mangaluuru and Bengaluuru, India in July
2016	35th International Geological Congress (IGC), Cape Town, South Africa Ninth IGEO Council meeting, Cape Town, Cape Town, South Africa 10th International Earth Science Olympiad, Mie, Japan

2017	11th International Earth Science Olympiad, Nice, France

Future plans

2018	GeoSciEd VIII, Campinas, São Paulo, Brazil 12th International Earth Science Olympiad planned for Thailand
2019	13th International Earth Science Olympiad planned for the Republic of Korea
2020	36th International Geological Congress (IGC) planned for New Delhi, India 14th International Earth Science Olympiad

GeoSciEd Conferences

1990 – Formation of the International Union of Geological Sciences (IUGS) Commission on Geoscience Education and Training (COGEOED)

- Senior Officers:
  - Chair: Gerry Cooray
  - Secretary/Treasurer: Dorrik Stow
  - Newsletter Editors: John Carpenter (1990 – 1993), Rajasekhariah Shankar (1993 – 1996)

1993 - The first geoscience education conference: International Conference on Geoscience Education and Training

- Dates: 20th – 24th April, 1993
- Venue: University of Southampton, UK
- Main sponsors: the Association of Geoscientists for International Development (AGID) and the International Union of Geological Sciences (IUGS) Commission on Geoscience Education and Training (COGEOED)
- Additional sponsors: ICSU, ASE (International), ESTA (UK), Geological Society, Geographical Association, BGS plus a wide range of financial sponsors
- Conference convenor: Dorrik Stow (UK); theme convenors:
  - Geoscience education in schools: Chris King (UK) and David Thompson (UK)
  - Higher Education: Bill Gaskarth (UK) and Brian Daley (UK)
  - Geoscience Training for Business, Industry and Public Service: Tony Reedman (UK)
  - Public understanding of geoscience: Ian Sutton (UK)
- Abstract volume: published by the Geology Department, University of Southampton, UK, 1993
- Proceedings volume: *Geoscience education and training*, ed. DAV. Stow and GJH. McCall, Balkema, Rotterdam, 1996.
- Notes:
  - David Thompson, Nir Orion and Chris King met in a small café to discuss the development of an international association.

1997 – GeoSciEd II

- Dates: 28th – 31st July, 1997
- Venue: University of Hawaii at Hilo, Hawai'i, USA
- Conference convenors: John Carpenter (USA), Vic Mayer (USA), Nir Orion (Is-

rael), Frank Ireton (USA) Laure Wallace (USA)

- Proceedings volume: *Conference proceedings: second international conference on Geoscience Education*, Ed. Fortner, W. and Mayer, M., Ohio State University, USA, 1998.
- Support for production and distribution of Proceedings volume provided by:
  - National Science Foundation, Directorate for Education and Human Resources (US)
  - National Aeronautics and Space Administration, Mission to Planet Earth programme (US)

  Conference registrations
  - The Ohio State University, School of Natural Resources and Office of Applied Communications
  - The Alphyl Memorial Endowment Fund of the Ohio State University, a fund established in honour of Victor C. and Phyllis C. Mayer.
- Awards for lifetime service to geoscience education:
  - Yolanda Alba de Gonzales (Venezuela)
  - Victor J. Mayer (USA)
  - Emmanuel Mazor (Israel)
  - David Thompson (UK)

- Notes:
  - A group of geoscience educators met in a small restaurant (Uncle Billy's Hilo Hideaway) in a rainstorm to formalise a proposal for an international association, prompted by Nir Orion.
  - This proposal was put to the general assembly at the conference, and was enthusiastically endorsed.
  - This was the formal beginning of an international association for earth science education.
  - Nir Orion and Chris King agreed to lead a development committee that would, among other things, determine the name of the association.
  - Later, having discussed different names, including the International Geoscience Education Association (IGIA), the name of the new association was eventually agreed as the International Geoscience Education Organisation (IGEO).

2000 – GeoSciEd III

- Dates: 16th – 21st January, 2000
- Venue: University of New South Wales, Sydney, Australia
- Major sponsor: Australian Geological Survey Organisation (AGSO)
- Conference convenors: Malcolm Buck (Australia), Ian Clark (Australia), Gary Lewis (Australia)
- Abstract and Proceedings volume: *3rd international conference on geoscience education: abstract volume*. Ed. Ian Clark, AGSO, Canberra, 2000.
- Award for lifetime service to geoscience education:
    - John Carpenter (USA)

- Notes:
    - The International Geoscience Education Organisation name was formally approved.
    - IGEO Chair elected: Chris King.
    - Later, the IGEO logo, website and constitution were developed.

2003 – GeoSciEd IV

Dates: 10th – 14th August, 2003.

- Venue: University of Calgary, Alberta, Canada.
- Major sponsors: IGEO, EnCana Corporation, Canadian Society of Petroleum Geologists Educational Trust
- Conference convenors: Alan Morgan and Godfrey Nowlan
- Abstract and Proceedings volume: *Earth science for the global community: conference proceedings.* Ed. The GeoSciEd IV organising committee, Calgary, Canada, pp257, 2003.
- Awards for lifetime service to geoscience education:
    - o Gerry Cooray
    - o Ward Neale

GeoSciEd IV delegates at the Royal Tyrrell Museum of Paleontology, Drumheller, Alberta.

Photo: Alan Morgan

- Notes:
    - IGEO Chair elected: Ian Clark (Australia).
    - The IGEO contribution to the forthcoming 32nd International Geological Congress in Florence, Italy in 2004 was planned.

2006 – GeoSciEd V

- Dates: 18th – 21st September, 2006.
- Venue: University of Bayreuth, Germany.
- Major sponsors: IGEO
- Conference convenors: Sylke Hlawatsch (Germany),Gabriele Obermaier (Germany), Ulrike Martin (Germany)
- Abstract volume: *Geoscience education: understanding system Earth*. Volume 48, the German Society of Geosciences, Hannover, 2006.

GeoSciEd V delegates.

Photo: Alan Morgan

Proceedings volume: *Abstract volume of GeoSciEd V*, 96. Hannover: Schriftenreihe der Deutchen Gesellschaft für Geowissenschaften SDGG.

- Notes:
  - IGEO Chair elected: Chan-Jong Kim (South Korea).
  - Plans were presented for the 1st Earth Science Olympiad, to be held at Seoul National University in Korea in October 2007.
  - Presentations were made to host GeoSciEd V by India and South Africa; South Africa was chosen.
  - Later the Senior Officers decided that IGEO should support:
  - the International Conference for Global Development (GeoDev) to be held in Dhaka, Bangladesh, on the 26th – 31st October, 2009 and
  - the Joint Assembly of Geoscience Organisations in the Americas, to be held at the Iguassu Falls, Brazil, on the 8th - 13thAugust, 2010.

2010 – GeoSciEd VI

- Dates: 30th August – 3rd September, 2010.
- Venue: University of the Witwatersrand, Johannesburg, South Africa.
- Major sponsors: IGEO
- Conference convenor: Ian McKay
- Abstract volume: *Geoscience education/developing the world*. University of the Witwatersrand, Johannesburg, South Africa, 2010.
- Notes:

GeoSciEd VI - IGEO Senior Officers

L to R: Rajasekharaiah Shankar, Bronte Nicholls, Chan-Jong Kim, Sylke Hlawatsch, Ian McKay, Roberto Greco.

Photo: Alan Morgan

IGEO Chair elected: Sylke Hlawatsch (Germany).

- IGEO Chair Elect elected: Rajasekhariah Shankar
- The IGEO contribution to the forthcoming 34th International Geological Congress in Brisbane, Australia, in 2012 planned.
- A presentation was made by India to host GeoSciEd VII, which was approved.

2014 – GeoSciEd VII

- Dates: September 5th – 9th, 2014.
- Venue: University of Hyderabad, Hyderabad, India
- Major sponsors: IGEO
- Conference convenor: Rajasekhariah Shankar
- Abstract volume: *Volume of abstracts,* International Geoscience Education Organisation.
- Notes:
  - IGEO Chair elected: Rajasekhariah Shankar (India).
  - IGEO Vice-Chair elected: Roberto Greco (Brazil)
  - The IGEO contribution to the forthcoming 35th International Geological Congress in Cape Town, South, in 2016 was planned.
  - Brazil was elected to host GeoSciEd VIII in 2018.

GeoSciEd VII - IGEO Senior Officers,

L to R: Anish Warrier, Robert Greco, Sylke Hlawatsch, Rajasekharaiah Shankar,

Bronte Nicholls, Gabriele Obermaier, Chris King.

International Geoscience Education Organisation (IGEO)

1997 The formation of an international geoscience education association proposed and endorsed
Chairs of the association development committee: Nir Orion and Chris King.

2000 International Geoscience Education Organisation (IGEO) formed (Sydney, January 2000).
First General Meeting.

Senior Officers, 2000 - 2003:
- Chair: Chris King (UK).
- Newsletter editors: Laure Wallace (USA) and Mary Dowse (USA)

IGEO logo, constitution and website developed.

2003 Second IGEO General meeting (Calgary, August 2003)
Second IGEO Council meeting (Calgary, August 2003)

Senior Officers, 2003 - 2006:
- Chair: Ian Clark (Australia)
- Vice-Chair (retiring): Chris King (UK)
- Vice-Chair (elect): Chan-Jong Kim (Korea)
- Secretary/treasurer: Alan Morgan (Canada)
- Newsletter editor: Bronte Nicholls (Australia)

2004 Third IGEO Council meeting (Florence, Italy, August 2004)

2006 Third IGEO General meeting (Bayreuth, Germany, September 2006)
Fourth IGEO Council meeting

Senior Officers, 2006 - 2010:
- Chair: Chan-Jong Kim (Korea)
- Vice-Chair (retiring): Ian Clark (Australia)
- Vice-Chair (elect): Sylke Hlawatsch (Germany)
- Secretary/treasurer: Alan Morgan (Canada)
- Newsletter editor: Bronte Nicholls (Australia)

2008 Fifth IGEO Council meeting (Oslo, Norway, August 2008)

2010 Fourth IGEO General meeting (Johannesburg, South Africa, September 2010)
Sixth IGEO Council meeting (Johannesburg, South Africa, September 2010)

Senior Officers, 2010 - 2014:
- Chair: Sylke Hlawatsch (Germany)
- Vice-Chair (retiring): Chan-Jong Kim (Korea)
- Vice-Chair (elect): Shankar Rajasekharaiah (India)
- Secretary: Roberto Greco (Italy)
- Treasurer: Gabriele Obermaier (Germany)
- Newsletter editor: Bronte Nicholls (Australia)

2012 Seventh IGEO Council meeting (Brisbane, Australia, August 2012)

2014 Fifth IGEO General meeting (Hyderabad, India, September 2014)
Eighth IGEO Council meeting (Hyderabad, India, September 2014)
Senior Officers, 2014 - 2018:
- Chair: Shankar Rajasekharaiah, India
- Vice-Chair (retiring): Sylke Hlawatsch, Germany
- Vice-Chair (elect): Roberto Greco, Brazil
- Secretary: Anish Warrier, India
- Treasurer: Gabriele Obermaier, Germany
- Newsletter editor: Bronte Nicholls, Australia
- Webmaster: Takashi Sawaguchi, Japan
- Advisor: Chris King, United Kingdom

2016 Sixth IGEO General meeting at the 35th International Geological Congress (Cape Town, South Africa, August 2016)

Ninth IGEO Council meeting at the 35th International Geological Congress (Cape Town, South Africa, August 2016)

Table Mountain overlooking Cape Town, the venue of the 35th IGC.

Photo: R. Shankar

International Earth Science Education Olympiads (IESO's)

1st International Earth Science Education Olympiad

Medal winners at the 1st IESO in South Korea.

Photo: R. Shankar

- Dates: 21st – 29th October, 2007
- Venue: Daegu and Youngwol, Korea.
- Convenor: Moo Young Song
- Number of participating countries: 8
- Chair of the IESO Advisory Committee: Chan-Jong Kim
- Chair of the IESO Coordinating Committee: Moo Young Song

2nd International Earth Science Education Olympiad

- Dates: 31st August – 8th September, 2008
- Venue: Manila and Bicol, the Philippines.
- Convenor: Miguel Cano
- Theme: Cooption in Addressing Climate Change
- Number of participating countries: 7
- Chair of the IESO Advisory Committee: Chan-Jong Kim
- Chair of the IESO Coordinating Committee: Moo Young Song

3rd International Earth Science Education Olympiad

- Dates: 14th – 22nd September, 2009
- Venue: National Taiwan Normal University, Taipei, Taiwan.
- Convenor: Chun-Yen Chang
- Theme: Human environment
- Number of participating countries: 17
- Chair of the IESO Advisory Committee: Chan-Jong Kim

• Chair of the IESO Coordinating Committee: Moo Young Song

4th International Earth Science Education Olympiad
• Dates: 19th – 28th September, 2010.
• Venue: Gadjah Mada University, Yogyakarta, Indonesia.
• Convenor: Hendra Amijaya
• Theme: The present is the key to the future
• Number of participating countries: 18
• Chair of the IESO Advisory Committee: Chan-Jong Kim
• Chair of the IESO Coordinating Committee: Moo Young Song

5th International Earth Science Education Olympiad
• Dates: 5th – 14th September, 2011.
• Venue: Department of Earth Science of Modena and Reggio Emilia University, Modena, Italy.
• Convenor: Roberto Greco
• Theme: Earth Science Renaissance: Science, Environment and Art.
• Number of participating countries: 34
• Chair of the IESO Advisory Committee: Sylke Hlawatsch
• Chair of the IESO Coordinating Committee: Moo Young Song

6th International Earth Science Education Olympiad
• Dates: 8-12 October 2012
• Venue: Olavarria, Argentina
• Convenor: Jose Sellés Martínez
• Theme: Energy, Water and Minerals for Sustainable Development
• Number of participating countries: 18
• Chair of the IESO Advisory Committee: Sylke Hlawatsch
• Chair of the IESO Coordinating Committee: Moo Young Song

Mentors and Observers at the 6th IESO, 2012.

Photo: R. Shankar

7th International Earth Science Education Olympiad

- Dates: 11-19 September
- Venue: Mysore, India
- Convenor: Rajasekhariah Shankar
- Theme: The Earth is indeed a family
- Number of participating countries: 27
- Chair of the IESO Advisory Committee: Sylke Hlawatsch
- Chair of the IESO Coordinating Committee: Sylke Hlawatsch

Advisory Committee Members at the 6th IESO, 2012. L – R: Hendra Amijaya, Suzanna Occipinto, Sylke Hwalasch, Rajasekhariah Shankar, Tom Tailer, Jose Sellés Martínez and Evgeny Nesterov.

Photo: R. Shankar

8th International Earth Science Education Olympiad

- Dates: 22-29 September 2014
- Venue: Santander, Spain
- Convenor: Rajasekhariah Shankar
- Theme: Sea and Mountains
- Number of participating countries: 24
- Chair of the IESO Advisory Committee: Shankar Rajasekhariah
- Chair of the IESO Coordinating Committee: Shankar Rajasekhariah

Mentors, Observers and Students at the 7th IESO in Mysuru, India.

Photo: R. Shankar

9th International Earth Science Education Olympiad

- Dates: 13-20 September 2015
- Venue: Poços de Caldas, Brazil
- Convenor: Marcelo Bregagnoli
- Theme: Soil
- Number of participating countries: 27
- Chair of the IESO Advisory Committee: Rajasekhariah Shankar
- Chair of the IESO Coordinating Committee: Rajasekhariah Shankar

Group photo of students during the ITFI, 9th IESO in Pocos de Caldas, Brazil.

Photo: R. Shankar

10th International Earth Science Education Olympiad

- Dates: August 20-27, 2016
- Venue: Mie, Japan
- Convenor: Ken Hisada
- Theme: Our Future: Earth & Space
- Number of participating countries: 29
- Chair of the IESO Advisory Committee: Shankar Rajasekhariah
- Chair of the IESO Coordinating Committee: Shankar Rajasekhariah

Participants during the 9th IESO in Brazil were asked to investigate why this rock has this shape.

Photo: R. Shankar

11th International Earth Science Education Olympiad

- Dates: August 22-29, 2017
- Venue: Côte d'Azur, France
- Convenors: Fabrice Jouffray and Jean-Luc Berenguer
- Theme: ... standing on the Earth, gazing at the Planets!
- Number of participating countries: 29 countries with student teams, 5 countries with observers
- Chair of the IESO Advisory Committee: Shankar Rajasekhariah

Chair of the IESO Coordinating Committee: Shankar Rajasekhariah

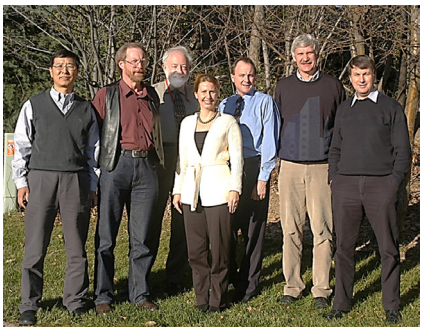
A multinational group of students carrying out the International Team Field Investigations (ITFI) during the 10th IESO, Mie, Japan.

Photo: R. Shankar

A group of students carrying out the International Team Field Investigation as part of IESO 2017 in France.

Photo: R. Greco

The International Union of Geological Sciences (IUGS) Commission on Geoscience Education and Technology Transfer (COGE)



The first IUGS-COGE Commission

Photo: Alan Morgan

The Commission was formed in November, 2004 in Boulder, Colorado with the following membership:

- Gary Lewis - Commission chairperson (Geological Society of America - USA)
- Wesley Hill - Commission secretary and treasurer (Geological Society of America - USA)
- Chan-Jong Kim (Seoul National University - South Korea)

Greg McNamara (Geological Society of Australia - Australia)

- Alan Morgan (Waterloo University - Canada)
- Chris King (Keele University - United Kingdom)
- Hans Albert Dahlheim (Germany)
- Ian Clarke (University of Adelaide - Australia)

The website was developed at: http://www.geoed.com.au/IUGSeducation/index-comm.html by Greg McNamara.

Membership from 2011:

- Jesús Martínez Frías - Chair (Spanish National Research Council, Spain)
- Chris King – Vice Chair (Keele University - United Kingdom)
- Jennifer Nocerino (Secretary/Treasurer – Geological Society of America)
- Miguel Cano (Bicol University - Philippines)
- Ian Clarke (University of Adelaide - Australia)
- Ochir Gerel Mongolian University of Science & Technology, Mongolia)
- Chan-Jong Kim (Seoul National University - South Korea)

Gary Lewis (Geological Society of America)

- Greg McNamara (Geological Society of Australia - Australia)
- Alan Morgan (Waterloo University - Canada)
- Adriana Niz (National University of Catamarca, Argentina)
- Rajasekhariah Shankar (Mangalore University, India)
- Ashvin Wickramasooriya (South Eastern University of Sri Lanka)

Jesús Martínez Frías – IUGS-COGE Chair

Membership in 2015:

- Jesús Martínez Frías - Chair (Spanish National Research Council, Spain)
- Chris King – Vice Chair (Keele University - United Kingdom)
- Jennifer Nocerino (Secretary/Treasurer – Geological Society of America)
- Miguel Cano (Bicol University - Philippines)
- Ian Clarke (University of Adelaide - Australia)
- Ochir Gerel Mongolian University of Science & Technology, Mongolia)
- Chan-Jong Kim (Seoul National University - South Korea)
- Gary Lewis (Geological Society of America)
- Greg McNamara (Geological Society of Australia - Australia)
- Alan Morgan (Waterloo University - Canada)
- Adriana Niz (National University of Catamarca, Argentina)
- Rajasekhariah Shankar (Mangalore University, India)
- Ashvin Wickramasooriya (South Eastern University of Sri Lanka
- Kmar Ben Ismail-Lattrache (University of Tunis El Manar, Tunisia)
- Yamina Bourgeoini (Cadi Ayyad University, Morocco)
- Elyvin Nkhonjera (Community Improvement Project, Malawi)

Membership from September 2016:

- Chris King – Vice Chair (Keele University, United Kingdom)
- Jesús Martínez Frías - Chair (Spanish National Research Council, Spain)
- Ian Clarke (Secretary/Treasurer - University of Adelaide, Australia)
- Greg McNamara (Webmaster - Geological Society of Australia, Australia)
- Miguel Cano (Bicol University, Philippines)
- Ochir Gerel Mongolian University of Science & Technology, Mongolia)
- Gary Lewis (Geoetc, USA)

Adriana Niz (National University of Catamarca, Argentina)

- Rajasekhariah Shankar (Mangalore University, India)
- Ashvin Wickramasooriya (University of Peradeniya, Sri Lanka)
- Yamina Bourgeoini (Cadi Ayyad University, Morocco)
- Elyvin Nkhonjera (Community Improvement Project, Malawi)
- Lola Pereira (Universidad de Salamanca, Spain)
- Young-Shin Park (Chosun University, Korea)
- Jaroslav Dostal (Saint Mary's University in Halifax, Canada)

Chris King

– IUGS-COGE Chair

The latest website can be found at: http://www.iugscoge.com/ and is still hosted by Greg McNamara.

Note: This series of histories is the best recollections of some of those involved. Please email any corrections or updates to the Webmaster.

International Geoscience Education Organisation (IGEO) teacher workshops

2014 – IGEO teacher workshop – linked to GeoSciEd VII

- Dates: July 2015
- Venues: Hyderabad
- Major sponsors: IGEO
- Organiser: Rajasekhariah Shankar
- Presenter: Nir Orion

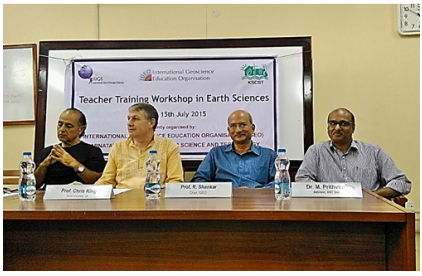
Nir Orion with participants at the Teacher Training Workshop, Hyderabad, India, August 2014.

Photo: R. Shankar

2015 – IGEO teacher workshops

Dates: July 2015

- Venues: Goa, Mangaluuru and Bengaluuru, India
- Major sponsors: IGEO
- Organiser: Rajasekhariah Shankar
- Presenters: Chris King, Nir Orion



Teacher Training Workshop, Bengaluuru, India, July 12-15, 2015. L – R: Nir Orion, Chris King, Rajasekhariah Shankar and M. Prithviraj.

Photo: R. Shankar

School students excitedly learning about minerals and rocks at the Earth Science Exhibition, Bengaluuru, India, 2015 linked to the teacher workshops (left) and Pune, India, 2016 (right).

Photos: R. Shankar

Cap. 2
International Earth Science Olympiad (IESO)

2.1 The organization of the International Earth Science Olympiad

By https://www.ieso-info.org/sample-page/

The **International Earth Science Olympiad**– IESO, was founded as one of the major activities of the International Geoscience Education Organization – IGEO.

IGEO is affiliated to and sponsored by International Union of Geological Sciences (IUGS). The aims of IGEO are to promote Geoscience education at all international levels, to encourage and develop the public awareness of Geoscience, especially among young people and to work on the improvement of the quality of Geoscience education all over the world.

The IESO is an annual competition for secondary school students (students not older than 18 years old on July the 1st of the year of the Olympiad). The students have to test their skills in all major areas of Earth sciences, including geology, geophysics, meteorology, oceanography, terrestrial astronomy and environmental sciences. The theoretical examination includes problems which are supposed to measure the participants' knowledge and understanding of Earth science areas. The practical examination consists of tasks which are designed to assess participants' abilities to carry out scientific investigations in earth science inquiries. The examinations are prepared by specialists in Earth sciences and Earth science education, who also provide solutions and evaluation guidelines. Each delegation is composed of 4 students and 2 supervisors. The latter must be specialists in Earth science and Earth science education and capable of serving as members of the International Jury. The official language of IESO is English; however, the supervisors may translate the written examinations and related materials into to the participants' native language.

The main aim of the IESO is to encourage students' interest and public awareness of Earth Science and to enhance Earth science learning. With the IESO the organizers hope to pick out talented and gifted Earth science students and to promote the improvement of teaching Earth sciences at schools. Last but not least, the IESO is developed in pursuit of encouraging friendly relationships among young learners from different countries and promoting international cooperation in exchanging ideas and materials on Earth sciences and Earth sciences education.

The IESO is the only International Olympiad that includes an International Team Field Investigation – ITFI. The last International Team Field Investigation focused on: developing stratigraphic sequences, evaluating living on the Mt. Mayon volcano, and evaluating the fault escarpment of the Chi-Chi earthquake. In 2010 in Indonesia the International Team Field Investigation focused attention on sustainability and use of the underground water. Thus, ITFI turns out to be a special IESO tool to encourage friendly relationships among young learners from different countries and to promote international cooperation.

Since 2013 another cooperative task was introduced: Earth System project (ESP). ESP emphasis on the evaluation and development of the following scientific skills: data collection, data analysis, reasoning, system thinking, communica-

tion and collaboration and oral and written presentation. As for ITFI, multinational groups of students work togheter in a research the topic using and analysing data but differetly to ITFI in this activities the data are not collected in the field, they are collect from the internet. The results and findings will be presented in the form of posters that will be viewed by all the IESO participants.

IESO Coordinating Committee
Members (past, present and future local organisers):
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Hisada Ken-ichiro (hisadak@geol.tsukuba.ac.jp),
Marcelo Bregagnoli (ieso2015@ifsuldeminas.edu.br);

IESO Advisory board
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Syllabus commission chair: Nir Orion (nir.orion@weizmann.ac.il),
Test commission chair: Gerard Bonhoure (gerard.bonhoure@gmail.com)

Advisory board:
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Ted Nield, Chairman Outreach Programme Committee, Planet Earth, IUGS (ted.nield@geolsoc.org.uk)

In this paragraph are collected information about the history of IESO collected in the first IESO website now not yet active, participating at some edition and in conversation with the main actor of this story.

From IESO-info website http://www.ieso-info.org/the-history-of-the-ieso/"

The idea of the International Earth Science Olympiad (IESO) was suggested by several Korean earth scientists before 2003. In 2003, Korean Earth Science Society (KESS) organized the first Korean Earth Science Olympiad (KESO). The second (2004) and the third (2005) KESO were organized successfully. The IESO was established as one of the major activities of the International Geoscience Education Organization (IGEO), during the International Council Meeting held in Calgary, Canada. The Meeting was part of the Fourth International Conference on Geoscience Education (GeoSciEd IV) in April 2003. During IGC32 held in Florence, Italy in August 2004, Eduardo de Mulder and Ted Nield of the International Year of Planet Earth (IYPE) management team agreed to support IESO as one of the ac-

tivities of the IYPE. Seoul IESO Conference was held in November 2004 in Seoul. Representatives from ten countries participated and discussed the earth science curricula and a desirable format of the IESO. There were made 23 presentations and the IESO Coordinating Committee was established. It was composed by 11 members including the Chairperson, Moo Young Song. The IESO Committee was renamed the IESO Advisory Committee later on. The Statutes for the IESO were also finalized. During the first meeting of the IESO Coordinating Committee, held during the Seoul Conference, it was concluded that Korea offered the best conditions and the most favourable atmosphere for hosting the first IESO. The efforts of the Committee combined with a great personal contribution of Prof. Moo Young Song resulted in the first International Earth Science Olympiad that took place in Korea in 2007.

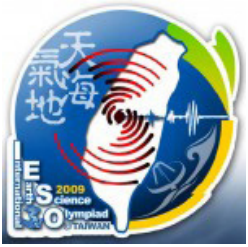
In 2005 the IESO Syllabus Commission (Chairperson: Nir Orion) was established and the first draft of the IESO Syllabus was elaborated. The IESO logo was designed and approved by the IESO Advisory Committee in March 2006

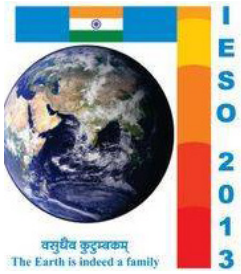
- **2007** – 1st edition – Republic of Korea, topic: Earth for Life, Universe for future Life
- **2008** – 2nd edition – Philippine, topic: Cooperation in Addressing Climate Changes
- **2009** – 3rd edition – Taiwan, topic: Human and Environment
- **2010** – 4th edition – Indonesia, topic: The Present is the Key to the Future
- **2011** – 5th edition – Italy, topic: Earth Science Renaissance: Science, Environment and Art
- **2012** – 6th edition - Argentina, topic: Energy, water and mineral for sustainable development.
- **2013** – 7th edition – India
- **2014** – 8th edition – Spain
- **2015** – 9th edition – Brazil, topic: Soil

Future IESO edition
- **2016** – 9th edition – Japan
- **2017** – 10th edition – France
- **2018** - 11th edition – Thailand
- **2019** - 12th edition – South Korea

The IESO is the only science Olympiad for secondary school students more than 15 years old founded outside of Europe. Till 2009 the IESO was held only in Asia and the majority of the countries involved comes from that area. One of the goals to have a IESO edition in Europe in 2011 was to involve more countries world wide. Since 2007 already 45 countries get involved, 37 countries participated with teams and 27 participated more than 2 times, see Tab. 2.1.

Past IESO edition Logos:





Tab. 2.1 List of the countries that attended previous IESO editions (elaborated by Roberto Greco)

Countries	South Korea 2007	Philippines 2008	Taiwan 2009	Indonesia 2010	Italy 2011	Argentina 2012	India 2013	Spain 2014	Brazil 2015
Argentina			ob		ob		ob		ob
Australia					x	x		ob	x
Austria					ob	ob	x	x	x
Bangladesh							x		
Belarus					x		x	x	
Brazil						x	x	x	x
Cambodia			x	x	x		x		
Cyprus					ob				
France			ob	ob	x	x	x	x	x
Germany						x	x	x	x
Honduras					x			x	
Hungary					x				
India	x		x	x	x	x	x		x
Indonesia	x	ob	x	x	x	x	x	x	x
Iran								ob	ob
Israel					x		x	x	x
Italy			x	x	x	x	x	x	x
Japan	ob	x	x	x	x	x	x	x	x
Kazakhstan									x
Korea	x	x	x	x	x	x	x	x	x
Kuwait				x	x	x	x	x	
Kyrgystan					x		ob		
Malawi					x		ob		ob
Maldive				x					
Malaysia					ob		ob		
Malta					ob				
Mongolia	x								
Nepal			x	x	x				
Nigeria							x	x	
Norway					ob				x
Pakistan					ob				
Paraguay									ob
Philippines	x	x	x	x	x				
Portugal								ob	x
Romania				x	x	x	x	x	x
Russia				x	x	x	x	x	x
Singapore		x	x		x				
South Africa					ob				ob
Spain					x	x	x	x	x
Sri Lanka			x	x	x		x		x
Taiwan	x	x	x	x	x	x	x	x	x
Thailand			x	x	x	x	x	x	x
Ukraine			ob	x	x	x	x	x	x
United Kingdom			x						
USA	x	x	x	x	x	x	x	x	x
Total countries	8	7	17	18	34	18	26	23	27
Total teams	7	6	14	17	26	17	23	20	22

Analysing the participation at IESO and at the International Geography Olympiad (iGeo) in 2015 (Tab.2.2) we noticed that nine countries participated of both competitions, four countries attended iGeo in 2015 and IESO in at least one past edition. Twelve countries attended only IESO 2015 with team, nine attended only IESO in the past and six attended IESO till now just with observers. We find even 23 country that attended only iGeo with team or only with observers (three).

If we add the country that attended IESO and/or iGeo in 2015 we count 51 countries with team and 7 just with observers. Additional others 10 countries attended IESO in the past with observers or team. That's number are what could be expected to have as countries participants in a international science Olympiad well established (9 years and 9 IESO edition, 19 years and 12 iGeo edition as for a while was a biennal competition).

Emerge a complementary between the participants of the two Olympiad probably influenced by the approach to Earth science in the different curricula, that in some countries is a separate subject, in others is part of geography curricula. For more details I suggested the lecture of

King, C. (2013). Geoscience education across the globe – results of the IUGS-COGE/IGEO survey. Episodes Vol. 36, no. 1, pp 19-29.

Tab. 2.2 Countries that participate at IESO and iGeo in 2015 (elaborated by Roberto Greco)

Countries	previus IESO edition	IESO 2015 Brazil	iGeo 2015 Russia
Argentina		IESO ob	iGeo team
Armenia			iGeo team
Azerbajan			iGeo ob
Australia		IESO Team	iGeo team
Austria		IESO Team	
Bangladesh	team		
Belarus	team		iGeo team
Bolivia			iGeo team
Brazil		IESO Team	iGeo ob
Cambodia	team		
Canada			iGeo ob
China People's Republic of			iGeo team
China-Hong Kong			iGeo team
China-Macau			iGeo team
Croatia			iGeo team
Cyprus	observer		
Czech Republic			iGeo team
Denmark			iGeo team
Estonia			iGeo team
France		IESO Team	
Finland			iGeo team

Germany		IESO Team	
Honduras	team		
Hungary	team		iGeo team
India		IESO Team	
Indonesia		IESO Team	iGeo team
Iran		IESO ob	iGeo ob
Israel		IESO Team	
Italy		IESO Team	
Japan		IESO Team	iGeo team
Kazakhstan		IESO Team	iGeo team
Korea		IESO Team	
Kuwait	team		
Latvia			iGeo team
Lituania			iGeo team
Kyrgystan	team		
Malawi		IESO ob	
Maldive	team		
Malaysia			
Malta	observer		
Mexico			iGeo team
Mongolia			iGeo team
Montenegro			iGeo team
Nepal	team		
The Netherland			iGeo team
New Zealand			iGeo team
Nigeria			iGeo team
Norway		IESO Team	
Pakistan	observer		
Paraguay		IESO ob	
Philippines	team		iGeo team
Poland			iGeo team
Portugal		IESO Team	
Romania		IESO Team	iGeo team
Russia		IESO Team	iGeo team
Serbia			iGeo team
Singapore	team		iGeo team
Slovakia			iGeo team
Slovenia			iGeo team
South Africa		IESO ob	
Spain		IESO Team	
Sri Lanka		IESO Team	
Switzerland			iGeo ob

Taiwan / China Taipei		IESO Team	iGeo team
Thailand		IESO Team	iGeo team
Turkey			iGeo team
Ukraine		IESO Team	
United Kingdom	team		iGeo team
USA		IESO Team	iGeo team

2.2 The others olympiads

The International Science Olympiads are worldwide annual or bi-annual competitions in several science topics. Usually the best 4-6 high school students (15-20 years old) from each country take part in them.

Even junior students Olympiads exist: International Junior Science Olympiad and even some Olympiads in humanistic area such as:

International Philosophy Olympiad

International Linguistic Olympiad

The science Olympiads are separate competitions, each one with is own organization. The main aims of science Olympiads is to promote career in science and even to challenge brightest students around the world and to compare the various teaching systems of each country.

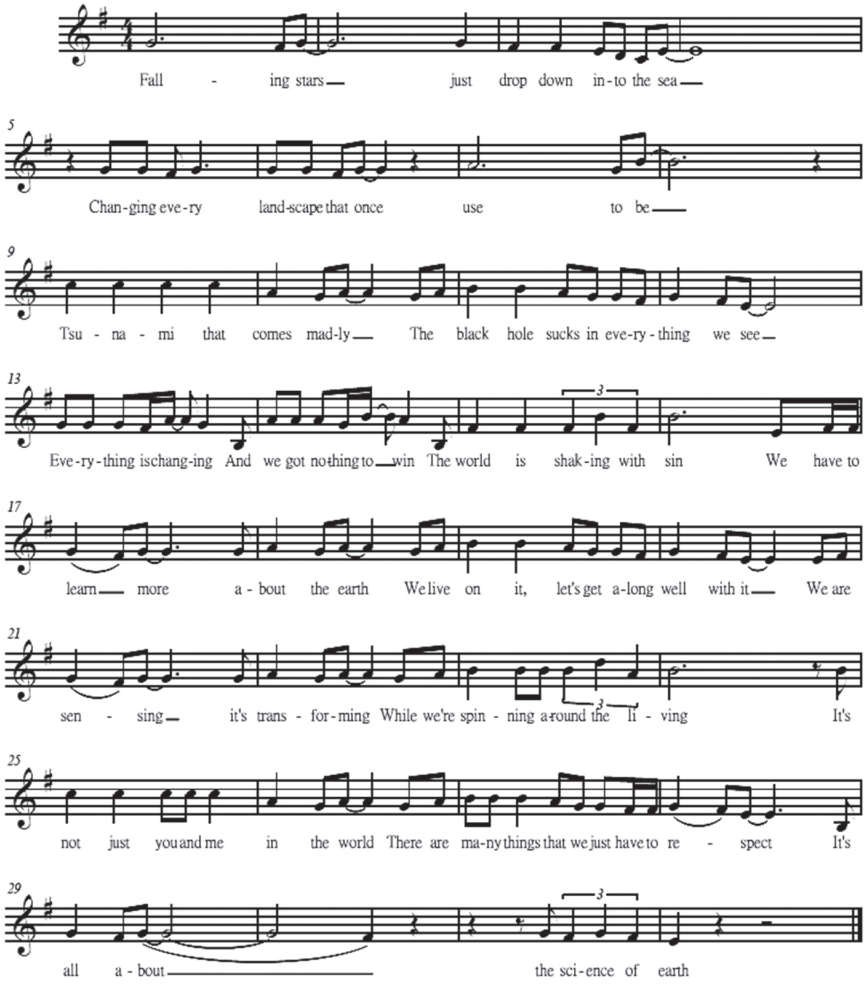
National competitions are settled in order to select national team. This national competition are even a way to spread interest in science. Usually the organizer of the national selection are academic institutions, museum, teachers associations. The way of select students vary quite a lot from the different Olympiads and in the different countries. The individual written test do a schools, regional and national level are probably the more common but alternative model that do selection on line or use team students exist as well.

In Tab 2.3 you find a list of main International Science Olympiad

Tab. 2.3 The main International Science Olympiad

	1st edition	First host country	Country delegation in 2015	Country host in 2015	Country host in 2016	website
International Mathematical Olympiad (IMO)	1959	Romania	104	Thailand	Hong Kong	http://www.imo-official.org/
International Physics Olympiad (IphO)	1967	Czechoslovakia	72	India	Swiss	http://ipho.phy.ntnu.edu.tw/
International Chemistry Olympiad (IChO)	1968	Poland	75	Azerbaijan	Pakistan	http://icho43.metu.edu.tr/
International Olympiad in Informatics (IOI)	1989	Bulgaria	83	Kazakhstan	Russia	http://ioinformatics.org/index.shtml
International Biology Olympiad (IBO)	1990	Czechoslovakia	62	Denmark	Vietnam	http://www.ibo-info.org/
International Geography Olympiad (iGeO)	1996	Netherland	40	Russia	China	http://www.geoolympiad.org/
International Astronomy Olympiad (IAO)	1996	Russia	11	Russia	Bulgaria	www.issp.ac.ru/iao
International Junior Science Olympiad (under 15 years old) (IJSO)	2004	Indonesia	42	South Corea	***	http://www.ijso-fficial.org/home
International Olympiad on Astronomy and Astrophysics (IOAA)	2007	Thailand	39	Indonesia	India	http://ioaa.info/ioaa2007/
International Earth Science Olympiad (IESO)	2007	South Korea	22	Brazil	Japan	http://www.ieso-info.org/

2.3 IESO 2009 Song



Cap. 3
IESO 2015 Preparatory work.

3.1 IESO in Brazil

Roberto Greco, Unicamp

IESO 2015 was planned to be host in Russia since 2011. During IESO 2014 the Russian staff communicate to all the IESO members that they could not organize IESO 2015 due to political and economical situation. So was necessary to find, in a hurry, a new country to host IESO 2015.

Since 2012 when I come in Brazil I get in contact to the Federal Institute of the South of Minas (IFSULDEMINAS) a technical federal Institution that organize the Brazilian Agriculture Olympiad (OBAP) and select students for IESO since 2012. In that year IFSULDEMINAS was planning to participate for the first time at IESO in Argentina and ask me for tips and advice. In 2013 I get the opportunity to train for one week the Brazilian team in the Federal Institute of Espirito Santo campus of Itapina, and later on I was invited to the final step of the OBAP and award ceremony in another IFSULDEMINAS campus. During this contacts I could appreciate the great dedication and competence of the IFSULDEMINAS rector and all his staff and the great organizations and potential of this institutions.

As I get some experience in organizing IESO as I coordinate IESO 2011 in Italy I'm aware of all the great challenge that means organize an IESO edition and look at me that Brazil, through IFSULDEMINAS was the best candidate to host IESO 2015. So I get in contact with IFSULDEMINAS Rector, Prof. Marcelo Bregagnoli and IESO chairman Prof. Shankar Rajasekhariah.

In few days they exchange official letter of agreement and in that way start the process and we start to get meting to organize IESO 2015.

October 12, 2014

Prof. Marcelo Bregagnoli
Reitor of Instituto Federal de Educação Ciências e Tecnologia Sul De Minas Gerais

Dear Reitor, Prof. Marcelo Bregagnoli

We are indeed glad to inform you that Brazil was unanimously chosen to host the 9th International Earth Science Olympiad (IESO) in 2015 at the meeting of the IESO Advisory and Coordinating Committee.

As you may already be aware, the UN proclaimed 2007-2009 as the 'International Year of Planet Earth' with the subtitle 'Earth Science for Society' to ensure greater and more effective use of Earth Science knowledge to build safer, healthier and wealthier societies. Increased number and frequency and greater impact of natural hazards such as earthquakes and floods, shortage of natural resources and global warming and climate change pose major threats to human race, and warrant a deeper understanding of the Earth and its processes. Earth literacy is necessary for everyone in every country. The global society needs more and more talented people in Earth Sciences. It is gratifying that South America, especially Brazil, is a leading country in Earth Science studies and earth resources.

The International Earth Science Olympiad (IESO) is an annual Earth Science competition for secondary school students. It was founded as one of the major activities of the International Geoscience Education Organization (IGEO), which I chair now; IGEO is an affiliated organization of International Union of Geological Sciences (IUGS). Students who are winners of the respective national competitions are invited to participate in the IESO. Many countries worldwide have supported the event.

The IESO is intended to raise students' interest in and public awareness of Earth Science, to enhance Earth Science learning of students, and to single out talented and gifted students in Earth Science. It is also developed in pursuit of encouraging friendly relationships among young learners from different countries and promoting international cooperation in exchanging ideas and materials about Earth Science, and the nature and culture of participating countries.

We ardently hope that Brazil would host the 9th IESO in 2015, taking over the reins from Spain, the host country of the 8th IESO. We understand that you, with the support of Prof. Roberto Greco, Vice-Chair of IGEO and Professor at the Geoscience Institute of Campinas University, UNICAMP, WHO ALREADY organized the 2011 edition of IESO, are willing to accept the responsibility of the Organizing Committee and management of the procedures for the 9th IESO.

If you need any official report / assistance from IESO Headquarters for preparations of IESO, it will be a great pleasure for us to provide you with. You may kindly refer to the statutes, syllabus and previous experiences and examples of IESO for the preparation and management of IESO.

Thank you very much in advance for your kind consideration.

Yours sincerely,

Prof R. SHANKAR
Chair, IESO Advisory Committee
Chair, IGEO (International Geoscience Education Organization)
Professor, Department of Marine Geology

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Secretaria de Educação Profissional e Tecnológica
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OFÍCIO/347.2014/REITORIA/GAB/IFSULDEMINAS

On November 5th 2014

Dear Professor R. SHANKAR
Chair, IESO Advisory Committee
Chair, IGEO (International Geoscience Education Organization)
Professor, Department of Marine Geology

1. It´s such a pleasure and a great surprise when we knew about the amazing opportunity for our Country to host the 9th International Earth Science Olympiad (IESO). Personally I had the chance to be at the 8th Edition in Spain, last September, when I could notice the importance of this event to improve and publish the knowledge of the Geoscience area, which has a world relevance.

2. It will be a great challenge and honor for us at the Federal Institute of Knowledge, Science and Technology fo the South of Minas Gerais (IFSULDEMINAS) to receive this invitation to promote the IESO, in a partnership with professor Roberto Greco (UNICAMP), which has experience and works together with the International Geoscience Education Organizacion (IGEO).

3. In this short period of time, since the invitation, we contact other renowned institutions of Education in Brazil inviting them to work together with us. Thus, we will have the support from the Federal Rural University of Rio de Janeiro (UFRRJ), the Federal University of Itajubá (UNIFEI) and the compromise of other Federal Institutes of Education of Brazil.

4. In this way, with a great pleasure we officially accept to execute the organization of the 9th IESO and to promote the competition with our partners. We suggest the city of Poços de Caldas (Minas Gerais State) to host the event. This city has 160 thousand inhabitants and is well-known by the tourism, environment and mineralogy.

5. Thereby, we thank the reliability in our institution and we will make all the efforts to correspond it.

Best regards

Marcelo Bregagnoli
Reitor do IFSULDEMINAS
DOU nº 154/2014 – Seção 2 – Pág. 2
Decretos de 12 de agosto de 2014

Sponsorship

International EarthScience Olympiad

INSTITUTO FEDERAL
SUL DE MINAS GERAIS

Partners

Prefeitura Municipal de Poços de Caldas

IGEO International GeoScience Education Organisation

UFJF Universidade Federal de Juiz de Fora

INSTITUTO FEDERAL
SÃO PAULO
Câmpus Bragança Paulista

UFRRJ
UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

Support

Embrapa

UNICAMP

Unifal MG
Universidade Federal de Alfenas

UNIFEI

USP

UFRJ

Ministério da Educação

GOVERNO FEDERAL
BRASIL
PÁTRIA EDUCADORA

3.2 About IFSULDEMINAS

Information by IFSULDEMINAS

Established in 2008, by 11.892 law, Federal Institute of Education, Science and Technology of South of Minas Gerais – IFSULDEMINAS was created by the merger of three former agrotechnical schools, located in three different cities: Inconfidentes, Machado e Muzambinho. These three schools were made campus, becoming part of one only institution with one goal: to promote the regional development by providing excellence in professional and technological education – at no cost for students.

Nowadays, IFSULDEMINAS offers different levels of degrees: technical high school, technical schools (for high school graduates or for students who are coursing high school at another school), undergraduate courses (bachelor, licensure and technological) and graduate courses in different fields. There are campuses in other cities as well: Passos, Poços de Caldas and Pouso Alegre, where financial resources were invested in order to build and restore their own buildings. Its infrastructure and equipment are able to meet student's requirements and expectations.

In December, 2013, IFSULDEMINAS extended its units to Carmo de Minas and Três Corações cities. These units offer technical courses. The aim is to expand professional education to 178 cities in the area, benefiting 3,5 million people, direct or indirectly.

Associating the triad Education, Research and Community extension services, our Institution works to attend the region needs, qualifying work force, offering services, developing researches to attend local economy and projects to improve people's quality of life. At Muzambinho Campus, for instance, the Bromatology Laboratory allows community to test water quality. In Machado, children with brain disorders have free treatment at the Equestrian Therapy Center; in Inconfidentes, a business incubator propagates entrepreneurship and insert companies into the market.

IFSULDEMINAS is also present in the region through network centers, offering online education and regular education. Those centers have local government cooperation, so IFSULDEMINAS offers courses and the local governments provide the facilities. There are about 40 centers in the region of South of Minas Gerais. Furthermore, short professional courses are offered through "Programa Nacional de Acesso ao Ensino Técnico e Emprego – Pronatec" (National Access to Technical Education and Employment).

Institute mission

"To promote the excellence on professional and technological education offering different levels of degrees, educating women and men to be reflective lifelong learners, creative, competent and humanists. By associating education, research and community extension services, we contribute to the sustainable development of South of Minas Gerais".

Cities where IFSULDEMINAS is present and courses offered:

Alfenas
Andradas
Andrelândia
Boa Esperança
Cambuí
Cambuquira
Campo Belo
Campos Gerais
Capetinga
Carmo de Minas
Cruzília
Guaxupé
Ilicínea
Inconfidentes
Itanhandu
Machado
Monte Santo de Minas
Muzambinho
Ouro Fino
Passos
Poço Fundo
Poços de Caldas
Pouso Alegre
Santa Rita de Caldas
São Gonçalo do Sapucaí
São Sebastião do Paraíso
Três Corações
Três Pontas

3.3 About OBAP

Information by IFSULDEMINAS

The sixth edition of the Brazilian Olympiad of Farming (OBAP), organized by IFSULDEMINAS, follows the success and impact of the previous editions and aims to encourage high school students to join in technical and scientific careers through research and innovation in agriculture and related fields; application of scientific knowledge; coping challenging situations and cooperation and integration among participants.

It is expected to motivate the participation of students in scientific research activities, regional development and production of technological innovations, thus returning to the Brazilian society, derived benefits of the improvement in the medium and technical levels of public education.

To develop this proposal, the IFSULDEMINAS has a partnership with the Brazilian Farming Research Corporation (EMBRAPA), Federal Institutes of Education, Science and Technology of South East Mines (IFSUDESTEMG), Federal Institutes of Education, Science and Technology of Acre (IFAC) and Rural Federal University of Rio de Janeiro (UFRRJ), all of them with historical quality and hindsight in the provision of basic and technical education in the field of Agricultural Sciences. Besides the partnerships, it is also sponsored by the Regional Coffee Growers Cooperative in Guaxupé (Cooxupé), Regional Farming Cooperative of Santa Rita do Sapucaí (CooperRita), Brazilian Support Service for Micro and Small Enterprises (SEBRAE), Ouro Fino Agribusiness and BASF.

In the first stage the top 50 teams are selected, with predefined criteria to ensure representation from all regions of Brazil. The top 15 teams and 5 students with the highest scores will be awarded. The best students of the 2015 edition will be the Brazilian representatives at the 10th International Earth Science Olympiad (IESO), to be held in Japan in 2016.

3.4 About Minas Gerais

Information by IFSULDEMINAS

Minas Gerais is one of the twenty seven federative states of Brazil and is located at southeast region of the country and its capital is Belo Horizonte. Having an area of 586.519 km², the state is the second bigger in population of the country and is the fourth state with the largest land area. It has borders to the south and southwest with São Paulo, in the west Mato Grosso do Sul, northwest with Goiás and the Distrito Federal, to the north and northeast with Bahia, east with Espírito Santo and the southeast with Rio de Janeiro. With about 20,86 million people living there, the territory is divided into 853 municipalities, being the largest amount among the states.

The topography of Minas Gerais is quite rugged, with some of the highest peaks of the country in its territory. The state is also home to the source of several major rivers in Brazil, which places it in a strategic position regarding to national water resources. It has a tropical climate which varies from cooler and humid in the south to semiarid in its northern portion and the temperature is average about 18 °C during the year. All these factors combined provide the existence of a rich fauna and flora distributed in biomes that cover the state, especially the cerrado and the threatened Atlantic Forest. Most of the mining territory has altitudes ranging between 900 and 1500 meters, with predominance of plateaus with scarps and valleys, most notable in the central region. The highest point in the state is the Pico da Bandeira, situated on the border with Espírito Santo state, with 2891 meters of altitude (the third largest), followed by Pico do Cristal with 2780 meters.

Because of its natural beauty and its historical heritage, Minas Gerais is an important tourist destination of the country. The Minas Gerais people have a peculiar culture, marked by traditional religious manifestations and typical cuisine of the interior, as well as national importance in contemporary artistic production and also in the sports scene.

Minas Gerais is the Brazilian state that has the third largest gross domestic product, which totaled 351.38 billion reais at the end of 2010. The state, according to 2012 data, has the third biggest export in the country, accounting for 12.78% of the products sold abroad, second only to São Paulo (26.55%) and Rio de Janeiro (12.88 %). The state's export, however, is very concentrated and based on commodities, particularly iron ore (43.15%), coffee (11.29%), ferroalloys (5, 86%) and gold (5.15%).The total volume of exports in 2012 was around U$D 33 million 000.00 (thirty three billion dollars).

3.5 About Poços de Caldas

Information by IFSULDEMINAS

Poços de Caldas is a city located in south-western Minas Gerais state, Brazil, in the micro-region of the same name. It lies on the boundary of the state of São Paulo at 1186 meters elevation and is the main social-economic nucleus of its region, having an area of 544 km² (85 km² urban and 459 km² rural) in the municipality.

The physical area is made up for the most part of a high plateau formed by mountains, fields and valleys with an area of approximately 750 km². The average elevation is 1200 m (3937 ft), with **Cristo Redentor**, the highest point, at 1686 m (5531 ft). The topography is highly suggestive of a volcanic crater and, given that the region's rocks are indeed igneous and there are hot springs, this gave rise to a common misconception that **Poços de Caldas** would be located inside the crater of a large extinct volcano. In reality, **Poços de Caldas** is inside a caldera that was formed by the collapse of a central portion of terrain amid elevated areas, and while the latter have volcanic origin, the process that formed the supposed "crater" had nothing to do with volcanic activity.

Poços de Caldas occupies a highly strategic geographical location, due to its proximity to São Paulo (243 km), Belo Horizonte (460km) and Rio de Janeiro (470 km), whose connections are made with good highways, and due to its integration into the routes of some hydro-mineral spas. Known for its thermal baths, the city has many resort hotels.

The climate is characterized by dry winters and mild summers. The winter is from April to September and has an average temperature of 15 °C and rainfall of 315 mm. The summer is from October to March and has an average temperature of 21 °C with rainfall of 1,430 mm. The average annual temperature is 17 °C.

The local soils are rich in minerals and yield thorium, zirconium, and bauxite, which is converted into aluminum there. The city has Brazil's first uranium-ore concentration plant, for use in the Angra I nuclear-power facility in Angra dos Reis.

Poços is also the home of one of the largest bauxite mines in the world belonging to Alcoa. Bauxite is an ore that contains at least 45% alumina, which is extracted to make aluminum.

The city is also famous for its glass, which is known internationally. The founders of the factories were descendants of the artistic glassmakers who lived on the Island of Murano, near Venice, in Italy. In the city there are four glass factories: Ca'D'oro, São Marcos, Veneza and Bonora.

Due to its wealth in hydro-mineral resources, **Poços de Caldas** is also known for the quality of the soap that it produces. Some are almost handmade. There are four factories in the city: Raízes, Antares, Sarandi and Terra Brasil.

The city is very well taken care of, with several green areas, among parks, squares, gardens and São Domingos mountain, which has trails for walking. The sulphurous water is the main attraction and can be consumed in several fountains and at the Thermas Antônio Carlos. There is an aerial tram to get to the Statue of Christ the Redeemer (1,686 mts.). At the top of the mountain there is a great view of the nearby mountains. The city also offers options such as a Japanese tea garden, a theme park, museums, theaters, and other cultural events, the most important being the yearly **Music in the Mountains Festival** (*Festival Musica nas Montanhas*)

3.6 Geologic Aspects of Alkaline Plateau of Poços de Caldas, Brasil

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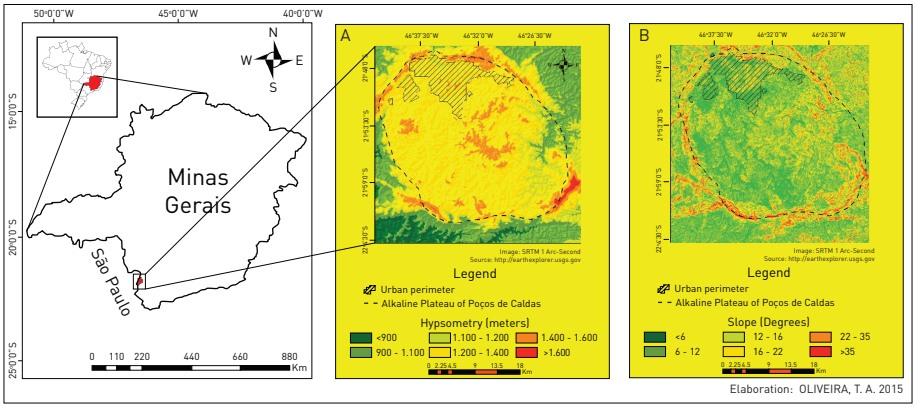
The Alkaline Massif of Poços de Caldas (Alkaline Plateau of Poços de Caldas), located South of Minas Gerais state - Brasil, is one of the biggest vulcanic structures in the world, with the eliptical shape of approximately 30 km of diameter and 800 km2. The average altitude of the host rocks around the plateau is 800 meters while the internal area of the plateau shows the average altimetry of 1300 meters. On the border of the plateau the altitude varies around 1500 and 1700 meters and the slopes are higher. (Picture 1)



Picture 1 – Minas Gerais State in feature in Brazil and altimetry (A) and slopes (B) of the alkaline plateau of Poços de Caldas, with the area of the district.

The age of alkaline intrusion is in superior mesozoic (Cretaceous 100 to 66 million years) and inferior cenozoic (Paleogene - Paleocene and early Eocene). The last volcanic event occurred at 55 million years. The sequence of events that culminated in the formation of the alkaline plateau of Poços de Caldas involved the uplift of embasement and the sediments followed by a long period of volcanic activity with lava spills and explosions and posterior formation of tufts. After this first period of activities follows a second characterized by sub-

sidence of the central portion of the massif followed by strong tectonic action. The intrusion of alkaline rocks compose the third period of structure formation. Denudational processes begin to act in the Cenozoic. The downgrade inside the plateau was processed too from hydrothermal actions that changed the rock consistency. This process was followed by the weathering action and the torrent of pluvial water.

Main Lithologies

In general, the lithological configuration of the plateau is represented by volcanic and plutonic rocks. With fewer representatives in the alkaline plateau of Poços de Caldas, occur meta-sandstones. The main lithologies in Alkaline plateau of Poços de Caldas as:

a. **Tuffs and breccias**, that are pyroclastic rocks come from consolidation of volcanic detritus.

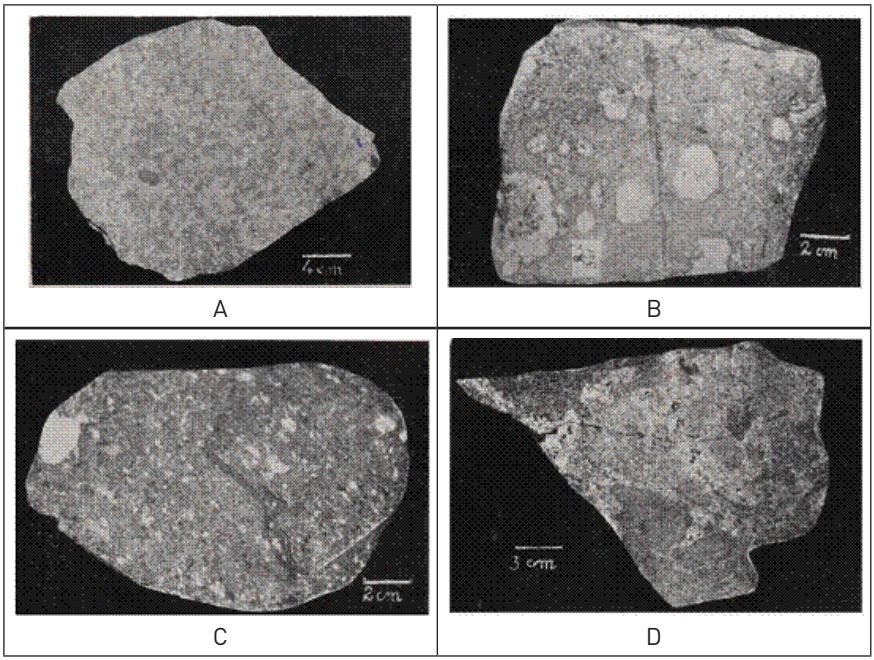
b. **Effusive rocks** (volcanics), that are volcanic magmatic rocks formed by the magma consolidation on surface. They are represented by:

- *Phonolitics lava*, located in the south part of the plateau bordering sediments. It´s thickness is over hundred meters forming steps exposed to the surface.
- *Phonolites e "Tinguaítos"*, they´re found around 1/3 of the massif area. The phonolites have thin and vitreous granulation, dark color and the minerals are seeing only by microscope. The "tinguaítos" are the intermediate stage of crystallization, and that´s why it´s rougher granulation. It´s the rock that makes the great circular border. In the center south east of the massif the "tinguaíto" is completely modified with the bauxite exposed.

c. **Intrusive Rocks** (plutonics), are embedded rocks represented by:

- *Foiaites*, rocks that have rough granular texture and they´re in general, intrusive in "tinguaítos".

The Picture 2 shows the main lithologies that occurs in alkaline plateau of Poços de Caldas.



Source: ELLERT, 1959.

Picture 2 – Main lithologies of alkaline plateau of Poços de Caldas. Volcanic breccia (A); Tinguaíto (B and C); Foiaite (D)

Fracture System

The alkaline magmatism in Poços de Caldas was conditioned to the existence and restart of a weakness zone of the crystalline embasement. In general, small fractures (smaller than 2 km) are more representative (75%). They´re oriented in: N100 – 200 E and N400 – 500 W

Groundwater Distribution

The groundwater is linked in the fracture systems of the rocks and the infiltration, flow and water storage. The water circulation will depend on the opening degree of the fractures, the length and the depth. The groundwater circulation occurs in 3 aquifer zones.

- one of small depth (30 meters);
- one intermediate (200 meters);
- one of higher depht (2000 to 3000 meters).

The last aquifer zone is related with the hidrothermal system.

Chemical Water Composition

Hyperthermals, alkaline, bicarbonated, sodic and sulfuric compose the chemical of wather. The upwelling temperature is 400 C to 440 C. Can be also found carbonate, sodium, sulfide e fluoride. Smaller elements are represented by iron (Fe), aluminum (Al) and phosphorus (P).

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Glossary of Terms

Alkaline intrusion - Penetration of igneous rocks rich in iron-magnesium minerals.

Bauxite - aluminum hydroxide formed from chemical weathering of rocks rich in feldspar.

Host rock - lithological structure that supports intruded material. Therefore the host rock it´s much older than the intruded material.

Fault - Discontinuity in the earth's crust usually derived from tectonic forces which occurs blocks movement. The offset surface is called *tailings*.

Fracture - Discontinuity in the earth's crust. The disruption did not involve blocks movement.

Hydrothermalism - hot water circulation by underground flows in faults and fractures. The process occurs in regions of volcanic activity but can also occur as inheritance of preterit volcanic activity.

Subsidence - vertical movement of the earth's crust which implies in lowering of blocks.

Tuff and breccias - volcanic rocks resulted from the consolidation of detritic materials expelled by volcanoes (lapilis, bombs, ash and lava).

Uplift - vertical movement of the earth's crust which implies in rising of blocks.

Volcanic caldera – circular to semi-circular shaped cavity that constitutes the crater from the explosion of the volcano.

3.7 Logotype and conception

Logotype IESO2015 - Conception

IESO2015
9th International Earth Science Olympiad
Poços de Caldas - MG - Brazil

DESIGN

The logo brings together a representation of 03 elements:

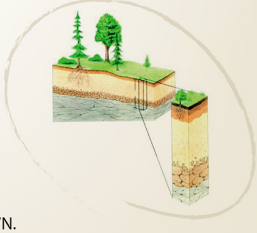
1) *Brazil;*

2) *The state of Minas Gerais;*

3) *The study areas of the IESO (atmosphere, hydrosphere, geosphere and Astronomy) highlighting the SOIL, theme defined by the FAO (United Nations Food and Agriculture) for the year 2015.*

The logo symbol format refers to the existing triangle on the flag of Minas Gerais, local headquarters of the 9th edition of the event.

The triangle's filling is formed by LAYERS in a direct symbolism with soil horizons.



COLOURS

For the color palette were chosen GREEN, YELLOW, BLUE, WHITE and BROWN.

The first four represents Brazil (Event seat this year). The brown color refers to the soil that is the subject defined by the FAO in 2015.

This set of colors was chosen to represent the areas studied by the IESO.

3.8 Materials

3.9 Medals

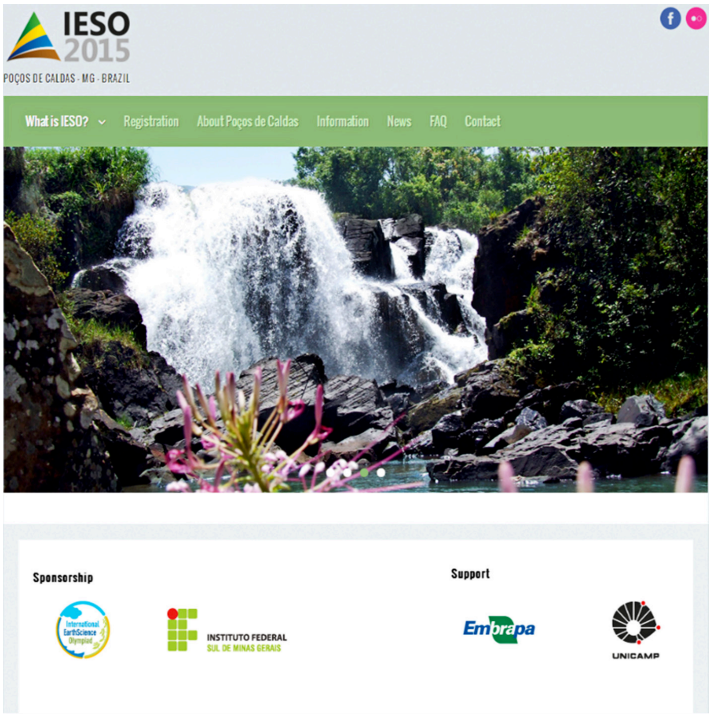

Sponsorship

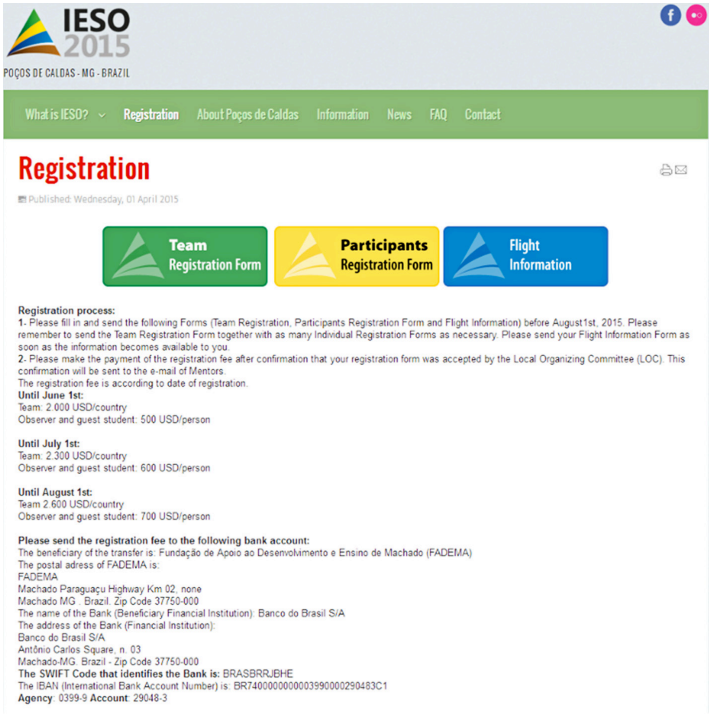

Sponsorship


IESO2015
IESO2015
IESO2015
IESO2015

3.10 Certificates

3.11 Online resources to support IESO 2015





IESO 2015
POÇOS DE CALDAS - MG - BRAZIL

What is IESO? | Registration | About Poços de Caldas | Information | News | FAQ | Contact

Registration

Published: Wednesday, 01 April 2015

Team Registration Form | Participants Registration Form | Flight Information

Registration process:
1- Please fill in and send the following Forms (Team Registration, Participants Registration Form and Flight Information) before August1st, 2015. Please remember to send the Team Registration Form together with as many Individual Registration Forms as necessary. Please send your Flight Information Form as soon as the information becomes available to you.
2- Please make the payment of the registration fee after confirmation that your registration form was accepted by the Local Organizing Committee (LOC). This confirmation will be sent to the e-mail of Mentors.
The registration fee is according to date of registration.
Until June 1st:
Team: 2.000 USD/country
Observer and guest student: 500 USD/person

Until July 1st:
Team: 2.300 USD/country
Observer and guest student: 600 USD/person

Until August 1st:
Team 2.600 USD/country
Observer and guest student: 700 USD/person

Please send the registration fee to the following bank account:
The beneficiary of the transfer is: Fundação de Apoio ao Desenvolvimento e Ensino de Machado (FADEMA)
The postal adress of FADEMA is:
FADEMA
Machado Paraguaçu Highway Km 02, none
Machado MG , Brazil. Zip Code 37750-000
The name of the Bank (Beneficiary Financial Institution): Banco do Brasil S/A
The address of the Bank (Financial Institution):
Banco do Brasil S/A
Antônio Carlos Square, n. 03
Machado-MG. Brazil - Zip Code 37750-000
The SWIFT Code that identifies the Bank is: BRASBRRJBHE
The IBAN (International Bank Account Number) is: BR7400000000003990000290483C1
Agency: 0399-9 **Account**: 29048-3

IESO 2015
POÇOS DE CALDAS - MG - BRAZIL

What is IESO? | Registration | About Poços de Caldas | Information | News | FAQ | Contact

Solemnity ends the ninth edition of the IESO with awards for the best classified of the competition

Published: Monday, 21 September 2015

Read more: Solemnity ends the ninth edition of the IESO with awards for the best classified of the competition

IESO 2015 has scientific, cultural activities and integration between delegations

Published: Friday, 18 September 2015

Read more: IESO 2015 has scientific, cultural activities and integration between delegations

Solemnity brings together delegations, authorities and academic community at the opening of the IESO 2015

Published: Monday, 14 September 2015

Read more: Solemnity brings together delegations, authorities and academic community at the opening of the...

Fourth day of the IESO is marked by practical tests in areas of astronomy, meteorology and hydrology

Published: Friday, 18 September 2015

Brazil receives 27 countries for the 9th IESO. Opening ceremony will be on coming Monday

Published: Sunday, 13 September 2015

From today on, delegations of 28 countries will be in Poços de Caldas to join the International Earth Science Olympiad. The event will bring together 250 students and teachers in a knowledge competition about geosphere, astronomy, hydrosphere and atmosphere.

IESO 2015
POÇOS DE CALDAS - MG - BRAZIL

What is IESO? Registration About Poços de Caldas Information News FAQ Contact

FAQ

Published: Thursday, 23 April 2015

FAQ - Frequently Asked Question

Who can participate?

"They can only be students of secondary school. If they have already graduated before the competition, the organizer must be informed about the date of their graduation."

Consequently:

1. Participant students must have been born on the 1st July 1996 or later.
2. The requisite of information about Secondary Education Grade is accomplished when Registration Form is completed.
3. Participant students can not have begun their University Studies on 13 Sept 2015, when they arrive to Poços de Caldas.

Do I need a visa to enter Brazil?

The Ministry of External Relations Immigration Division do have a page devoted to foreing visitors:

http://www.portalconsular.mre.gov.br/estrangeiros/vistos-para-estrangeiros

If necessary apply for a tourist visa by filling out the Visa Application Form - available in Portuguese, Spanish, French and English - and look for the nearest Brazilian consulate.

List of countries whose citizens need or not a visa:

www.portalconsular.mre.gov.br/estrangeiros/qgrv-simples-ing-25.03.2015.pdf

What kind of documents should we send after registation?

Once you pay the registration fee, the Mentor representing the team must send to the e-mail **ieso2015@ifsuldeminas.edu.br:**

a) Deposit receipt of the country registration fee and of the observers and guest student with the country information (e.g. IESO2015 Brazilian Team, or IESO 2015 José da Silva Brazilian Observer.) or inform the payment was made via Paypal.

b)Scanned first page of passaport of the team member. Every Scanned should be an independent file named mentor-country-name-surname.jpg, student-country-name-surname.jpg, gueststudent-country-name-surname.jpg, or observer-country-name-surname.jpg.

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Cap. 4
Some nationals selection case

4.1 The Australian national selection process for the IESO team

Greg McNamara[1]
Lillian Lesueur[2]
Bronte Nicholls[3]

Abstract

Australian Science Innovations (ASI) conducted an Australia-wide search to find talented secondary students to represent Australia at the International Earth Science Olympiad for the first time in 2014. Prior to this Australia has been represented at an IESO several times but only by teams chosen from one or two schools.

In this national selection process Year 10 and 11 high school students are invited to test their knowledge of earth and environmental science by sitting a special national exam. This tests for general geoscience knowledge up to Year 10. It also tests for analytical thinking and problem solving skills through the use of more complex questions with content that may be unfamiliar but which is fully explained within the context of the question. All questions are written by ASI and evaluated by independent critical friends working in each sphere.

There is no expectation that only students studying earth and environmental science will sit this exam because very few students in Australia are enrolled in this subject in Year 11 and 12. Rather, students who are high achievers in any aspect of science at school are encouraged to sit the exam. The two hour exam is sat in school, supervised by school teachers, on one day in August nation-wide.

The top 24 students are invited to attend an intensive 2 week January summer school where their theory and practical skills are developed further in a university environment with content somewhat equivalent to first year university level. A four-member team is selected to compete at the IESO based on the outcomes of summer school assessments. The selected team undergoes a further week of intensive training specifically for the IESO in July. In addition, the team is mentored on-line and provided with further reading and feedback on problem solving.

Keywords: Australia, ASI, Olympiad, IESO

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3. Australian Science Innovations, Earth and Environmental Science Olympiad Program Deputy Director: bronte.nicholls@@asms.sa.edu.au

4.2 Austrian national selection and preparation process for IESO

Sabine Seidl[4]

Abstract

Austria's debut at IESO was 2011 in Modena, Italy, where Peter Holub -- head of Regional Centre for Didactics of Natural Science with focus on didactic education and training for natural sciences at elementary and secondary level -- represented Austria as an observer. Since 2012 I took over and participated in IESO 2012 in Argentina as an observer. By then I had already had intense contacts with potential regional and national sponsors in the realms of academics, economy and the national government. Between 2012 and 2013 I had numerous successful meetings with universities, government representatives and potential IESO business partners to launch Austria's participation at IESO 2013 in India. Finally the money was in place and both the national selection/basic training as well as the high level training could commence.

Responsible for the Austrian selection and the training are various institutions initiated by me. The selection process is part of the basic training, the high level training takes place with selected students only. The selection starts with an intrinsic and detailed application including a motivation letter from students all over Austria. Then the Regional Centre for Didactics of Natural Science and Talentecamp Carinthia takes over to perform the selection process including the Basic Training. The High Level Training is distributed over several national institutions: Alpen-Adria University Klagenfurt Institute for Geography, Technical University Graz Institute for Earth Sciences, the Geozentrum Gmunden in Upper Austria, the Museum of Carinthia section Geology, the Central Institute for Geodynamics and Meteorology Carinthia and the Astronomy Association Carinthia; these institutions guarantee that IESO candidates are best prepared and obtain a profound geoscientific knowledge - in theory and in practice.

Keywords: Centre for Didactics of Natural Science, Basic Training, High Level Training

4. Regional Centre for Didactics of Natural Science, University College of Teacher Education Carinthia, Austria: sabine.seidl@ph-kaernten.ac.at

4.3 The teaching of earth sciences in Brazil

Sindynara Ferreira[5]
Cleiton Lourenço de Oliveira[6]

Abstract

The teaching in Brazil was restructured after the end of military dictatorship in 1980s. Previously, the teaching that had a professional line secured with by law, came to be treated as scientific, technological, philosophical and artistic. Currently, the Earth Sciences teaching is treated since the first stage of elementary school, when it is inserted in the discipline of science, followed by second phase of elementary school, when it becomes more specific within the Biology, Physics, Geography and Chemistry disciplines, until finally get to high school, dealing with the same subjects in greater depth. High school may be integrated into technical education. As an example, the Federal Institute of Education, Science and Technology from South of Minas Gerais State, Campus Inconfidentes offers high school integrated technical courses, such as Agricultural and Surveying that have direct focus on Earth Sciences, both in high school, as in technical education, teaching about origin and formation of soils, organic matter, fertility, etc. In addition to the integrated technical courses are also offered undergrad courses as Agricultural Engineering, Degree in Biological Sciences, Surveying and Cartography Engineering, etc. that directly work topics related to the Earth Sciences teaching. The teaching of earth sciences in Brazil is in an interconnected way, so that the activities are interdisciplinary. Topics related to Earth Sciences are treated comprehensively and, at the same time, specific within each of the disciplines that involve the basic, technical or undergrad student training.

Keywords: Brazil. Earth Science Teaching. Technical High Scholl Integrated.

5. Sindynara Ferreira. Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais – Campus Inconfidentes, Reseacher Professor. Inconfidentes, Minas Gerais, Brazil. sindynara.ferreira@ifsuldeminas.edu.br

6. Cleiton Lourenço de Oliveira. Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais – Campus Inconfidentes, Researcher Professor. Inconfidentes, Minas Gerais, Brazil. cleiton.oliveira@ifsuldeminas.edu.br

4.4 Preparation and selection of the IESO French Team

Gérard Bonhoure[7]
Mathieu Rajchenbach[8]

Abstract

The selection of the IESO French team is supported by "Sciences à l'École" (Sciences at School) an established structure of the Ministry of Education and Research. This structure is financed by the French government and also by corporate funds.

In October each year, teachers are invited to register their students for the IESO French selection. This year, 1910 students from 135 schools have been registered.

The french teaching curriculae is very different from the IESO syllabus (especially in astronomy, hydrology and meteorology). Consequently, online preparation (free access after registration) is offered by "Sciences à l'École" to students preparing for IESO.

In spring, the candidates take two written tests: the IESO test organized by "Science in School" and the french national earthscience Olympiads organized by the Ministry of Education. The four students who get the best ranking for this two written tests are selected.

At the end of the summer, the four students spend one training week together in southern France (near the Alps). During this internship, they practice field geology, visit scientific laboratories and museums. Some nights, they look at the stars and dream of the international meeting to come...

Keywords: France, French, IESO, Géosciences

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4.5 German Earth Science Olympiad (GeESO)

Sylke Hlawatsch
Detlef Sowinski
Ingrid Hemmer[9]

Abstract

Earth sciences are not a regular subject in German schools. Even though geoscience themes could be taught in geography and science classes, optional courses or clubs, it rarely happens. The reason is that most teachers, mainly trained in human geography, biology, chemistry and/or physics, feel uncomfortable teaching geosciences. In 2004 the "Fachsektion Geodidaktik und Öffentlichkeitsarbeit der GEOUNION[10] (DGGV[11]/HGD[12])" was founded in order to bundle all existing activities that aim to enhance quantity and quality of geoscience education in Germany. GeESO is advertised and the selection coordinated by this body since 2012.

Students are prepared by their teachers in cooperation with local geoscientists. Teachers register interested and able students by December 20th each year via the GeESO-website[13]. All teachers together agree upon the selection modus for the German national team. Since 2015 an online test was conducted. Based on those tests the members of the German national team are selected. Mentors are the teacher of the selected national team members.

Keywords: Germany, Olympiade, Geowissenschaften, Schule

9. Richard Hallmann Schule mit Oberstufe, Gablonzerstraße 42, D-24610 Trappenkamp, E-Mail: info@die-deutsche-olympiade-der-geowissenschaften.de
10. GeoUnion. Internet: http://www.geo-union.de/startseite.html
11. German Geology Association (Deutsche Geologische Gesellschaft) Internet: http://www.dgg.de/cms/wir-ueber-uns/index.html
12. Academic Association for Geography Education (HGD – Hochschulverband für Geographiedidaktik) in Germany. Internet: http://geographiedidaktik.org/en/home/
13. German Earth Science Olympiad (Die deutsche Olympiade der Geowisenschaften). Internet: http://www.die-deutsche-olympiade-der-geowissenschaften.de

4.6 Selection Procedure of the Indian National Team for the Participation in the International Earth Science Olympiad (IESO) Events

Hema Achyuthan[14]
K.S.Godhavari[15]

Abstract

Like the other International Olympiads such as, of the physics, chemistry, mathematics, astronomy and life sciences; the International Earth Science Olympiad (IESO) is an annual event organised for higher secondary school students hailing from different countries across the world. It is one of the major activities of the International Geoscience Education Organisation (IGEO; www.geoscied.org) promoting earth science education in schools all over the world. The principal objectives of IESO are

I. to upraise the student's interest in and public awareness of Earth Science,
II. to enhance student's learning of Earth Science,
III. to upgrade and improve teaching of Earth Science in schools, and
IV. to build and foster friendly relationship among the young participants from different countries and promote international co-operation in exchanging ideas about Earth Science and Earth Science education.

In the past, IESO events were organised in South Korea (2007), the Philippines (2008), Taiwan (2009), Indonesia (2010), Italy (2011), Argentina (2012), India (2013) and Spain (2014).

For the selection of the Indian national team representing India, an initial nationwide entrance test is conducted for the selection of about 20 students. The entrance test is conducted at about 70 centers covering major cities of India. In its endeavour to popularize this program as its outreach activity, the Geological Society of India, is making efforts to conduct test at several more centres. The Fellows of the Geological Society of India, act as local co-ordinators for the smooth conduct of the entrance test. Advertisement for this selection is done through announcements in schools, website of the Geological Society of India, and local news papers.

For the initial selection a question paper is prepared calling in experts in the

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earth system science subjects. These experts are drawn from the Universities, National Laboratories, Ministry of Earth Sciences and Mines Departments of the country. Two sets of question papers are prepared (but only one is used) with one hundred objective type questions each with multiple choice (4 on an average) covering the syllabus prescribed by the IESO. The top 20 students in order of merit are subsequently invited and imparted intense training for about three weeks covering all the four branches of Earth Science viz., Geosphere (45%), Atmosphere (20%), Hydrosphere (15%) and Astronomy (20%) at the Geological Society of India, Bangalore, or any of the Geology Departments in the country. The resource persons are drawn from Universities, Indian Institute of Technology, Indian Institute of Science, Government departments, National Laboratories etc. The participants are also given laboratory and field training by the geologists of the Geological Survey of India. The laboratory facilities extended by the Geological Survey of India, is often utilised for imparting practical training. This training ends with a test (Indian National Earth Science Olympiad) for selecting only four students in the order of merit to represent India.

A pre-departure training is also organized for nearly a week before leaving for the main IESO competition and the selected resource persons are once again invited to interact, deliver lectures and impart both field and laboratory training to the selected students. Since this is a very competitive examination, selection of the national team demands a dedicated team of faculty members from various research institutions, university earth science departments, national laboratories etc. It involves continuous monitoring of the students performance, upgrading and updating the IESO syllabus and the procedure of the conduct of the examination. This is also done to carry out the examination in ambient and healthy environment.

The Indian team is represented generally by one/two mentors, one/two observers and four student participants. Generally, it has been observed that the Indian students win Silver and Bronze medals and Best Performance awards in group activities. In this entire process the Geological Society of India, Bangalore plays a major role in conducting entrance test, organizing training programmes for the selected students for this event coordinated by an national coordinator.

The entire programme is encouraged and financially supported by Ministry of Earth Science (MOES), New Delhi as part of its outreach program. Selection of the Indian team representing India is carried out under the auspicious of the Geological Society India, Bangalore, funded by the Ministry of Earth Science, New Delhi, following the rules governed by the Department of Atomic Energy, New Delhi, that oversees the proceedings of the other National Olympiads such as the life sciences, mathematics, physics, chemistry and astronomy etc.

4.7 The participation of Italian in IESO: educational experiences and relapses

Susanna Occhipinti[16]

Abstract

Italy participates in the IESO with his own team since 2009, accompanying their representative with its mentors.

In the years, Italy has obtained good results, achieving a gold, some silver and several bronze medals. The commitment of the students in the international tests was always great and the participation enthusiastic and involving.

The Italian participation is due to the efforts of ANISN - Italian Association of Teachers of Natural Sciences, (www.anisn.it), which organizes a selection in more than 400 schools of Italy, than a regional test and finally a national selection, involving in the Olympiad of Natural sciences about 20.000 students of secondary schools. The Italian Minister of Education supports the test and includes students with the best results in the national list of excellence, giving them a small grant.

The national test is a multiple-choice test, with numerous questions, requiring a good level of knowledge in Earth science. There is also a practical test, which requires skills, competences to recognize rock properties, read geological and topographical maps, observe and identify landforms.

The ten students who have obtained the best results participate to a one weeklong stage at the Camerino University where, with the support of academics and PhD, they deepen theory and apply it in different experiences, using when possible, inquiry and problem solving.

Participate and obtain good results in the international tests is a challenge for Italy, related to a global context into account the huge investment and effective educational strategies adopted for the Sciences in other countries. Particularly, in a national contest in which Earth sciences are poorly considered, despite the great relevance that geological issues have on the Italian territory, IESO represent an important opportunity to increase the attention of the educational system and even of the society, towards Geosciences.

Keywords: ANISN, Inquiry, UNICAMEarth

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4.8 Involving Japanese students into geoscience and growing up them to send IESO

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Abstract

Earth Science Education in compulsory education is elementary and lower secondary schools in Japan. During the lower secondary school, natural science class dealing with quite basic geology, meteorology and astronomy on the basis of science class in primary school. Even though practical activities in the science class are common, open-air lessons are rarely conducted because of shortage of lesson time.

Basic Earth Science classes are mainly given for general course students of high schools. In contrast to the contents of junior high school science class treating regional phenomena, the high school students will improve their knowledge about ideas of plate tectonics, volcanism and seismic activity, co-evolution of earth, global atmospheric circulation and origin of the universe, etc.

Japanese national selection process for IESO consists of three steps. Firstly, the preliminary of the selection is held in various regions. For the written test, students answer questions concerning basic earth sciences taken from high school textbooks.

About 2000 students from almost all through Japan now participate in this written test. Secondary, approximately 60 students who win trial race can take part in the second race. Practical tests related to geology in addition to written tests at the level such as course of university freshmen. Description format exams are on the test.

Finally, 10 winners will advance to the finals. We conduct written exam, interview, and group discussion concerning geoscience. The final is tested in English, though the preliminary and second selections are tested in Japanese. After that, we pick out four delegates for IESO.

Training program as preparation process for IESO lasts between April and September until just before IESO. Committee of JESO serves training camps twice for the delegates with research organizations, such as museum and university. Each camp lasts a few days. Purposes of the training camps are designed to improve the students' knowledge and ability related to earth science, and mutual understanding among them.

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4.9 Kazakhstan team

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Abstract

Kazakhstan became a member of International GeoScience Education Organisation in 2014. Before this we took part in international geological competitions held in Russia and in Kazakhstan. As far as our country is very rich in minerals we also need very qualified specialists in geology. Beginning from 2010 every year we have geological Olympiads between teams from all over Kazakhstan. There are nearly 20 teams in Kazakhstan now and we are working hard to extend the number of teams in every city and even the villages. Before going to the annual Kazakhstan Olympiad the regions have their own small competitions where they select the best representatives to the Republican competition. During the Olympiad students should show their skills and knowledge in competition: " geological path ", " Geological section ", " Paleontology ", " Mineralogy and petrography ", "Hydrology ", " Radiometry "," placer testing " and tests in general geology. At the end of the competition the winners are chosen who have the right to participate in international competitions such as the IESO. The winners of the Republican Olympiad 2014, also were selected of English language proficiency for the Brazil IESO Olympiad.

Keywords: IESO 2015, Brazil, Kazakhstan team

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4.10 Selection and preparation processes of Korean team

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Kyu-Seong Cho[23]
Siek Hyung[24]
Kiyoung Lee[25]
Kyuho Lee[26]
Gong Soo Chung[27]

Abstract

The Korea Earth Science Olympiad (KESO), an organization of the Korean Earth Science Society (KESS), manages the whole processes of selection and preparation for IESO. KESO was established by the effort of the Earth Science professors and researchers who are members of KESS with aims: 1) to enhance the interest of students as well as the public about Earth Science, 2) to discover talented and motivated students in Earth Science, 3) to educate and train young leaders in Earth Science, and 4) to select the Korea representatives who will participate in the IESO.

KESO runs a series of programs for the high school and middle school students who apply to the one and half year KESO program starting from April. The KESO program begins with screening of applicants based on their scholastic record only at first. A series of education programs with subsequent selection processes are offered to selected applicants, both of these are provided by professionals from universities and research institutes in Korea. The education programs include seven weeks of online classes, four-day summer camp, another eight weeks online classes, and two days field excursion. After each stage of education program, reduced number of students is selected. When twenty students are selected at the fourth round of selection, they are invited to one week-long winter camp. At the final day, students are evaluated through written test

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and interview and four of them are selected as national representatives. Then four representatives take the second phase of education program including ten weeks-long online classes, one week-long summer camp, field trips, and four-day laboratory classes. Through the operation of the one and half year long education program, KESO tries to offer as much subjects as possible of the IESO syllabus to the beneficiary students.

Keywords: Korea Earth Science Olympiad, Korea Earth Science Society, disciplines of the Earth Science, test and evaluation

4.11 Earth Science Education and National Selection and Preparation Process for International Earth Science Olympiad in Malawi

Yvonne Chasukwa Mwalwenje[28]
Elyvin Nkhonjera Chawinga[29]

Abstract

Earth Science concepts in Malawi are taught under a broad discipline of Geography. Geography covers Astronomy, Oceanography, Geomorphology, Geology and Environmental Science. Malawi first entered a team at the International Earth Science Olympiad (IESO) in 2011. The country's national selection process is an integral part of the team's performance at the Olympiad.

The country's education comprises of public and private schools. Private schools are categorized into international and national (Malunga 2001). An objective test is conducted at a cluster to identify participants to national team. A cluster consists of a maximum of twenty secondary schools (Ministry of Education, 2001). Mentors facilitate all the test processes.

The procedure starts in December of the preceding year with a workshop. Mentors familiarize candidates with IESO syllabus including Olympiad regulations and ethics. To cut logistical costs, mentors move across the three regions of Malawi to conduct the selection test.

Gronlund (1990) asserts that for results to be reliable, professional ethics of validity, fairness and consistence must always be upheld in assessment leading to selection. Similarly, Malawi's IESO assessment has always been effective and has never been affected by opinions, feelings, impressions, and any social value. Consequently, such selection process control has assisted the country identify caliber students.

However in a bid to meet country's representation, it is a challenge to select a team that is national representative from both private and public schools. Mentors observe that successful students in selection process are dominated from International Private Schools since they have best teaching and learning resources. Although public students put effort on the assessment, their formation handicaps their success.

Therefore, this paper argues that there is no fairness in the selection of Malawi IESO team. Unless the backgrounds become leveled, the students from International Private Schools will continually dominate Malawi IESO team.

Keywords: Malawi, International Earth Science Olympiad, Assessment, Mentor, Selection

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4.12 International Earth Science Olympiads: inspiring a new generation of Norwegian geoscientists

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B. F.Moen[32]
A. Rotevatn

Abstract

In Norway the recruitment for natural science education has been low for several years. As an incentive to meet this deficit, geoscience was introduced as a subject matter in upper secondary school in 2007. Through the participation in IESO, the intention is to further incentivate and stimulate the interest in the natural sciences.

IESO are considered very prestigious in many countries, and the level is somewhat more advanced than what Norwegian students are taught in upper secondary school. Norway participated for the first time in Spain in 2014, and again in 2015 in Brazil. The participants were selected during two local qualification rounds as well as a four-day national training and qualification session at the University of Bergen (UiB). In Norway, the interest for IESO has increased from 100 participating schools in 2014 to 120 schools in 2015, when 730 students participated in the qualifications.

In both qualification rounds, the students answer multiple choice questions based on their upper secondary curricula. In the national final, the students are evaluated based on I. multiple choice questions on topics given in lectures, practical exercises and field studies during the training camp, and II. an essay on the students motivation for participating at IESO. All questions are prepared by lecturers at UiB who also evaluate the results from the national final. The results from the local qualifications are evaluated by the students' teachers.

Even more important than reaching the four students that qualify for the olympiad, are the high number of students that participate in the qualifications and especially the 100 highly motivated students that go to the second round, and the 16 that go on to the national final in Bergen. At the training camp at UiB, the secondary school students meet university students and young researchers studying and working with the diverse geoscience subject matters of IESO.

Keywords: Norway, geoscience, olympiad, upper secondary school

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4.13 The Portuguese Olympiad of Geology: a successful example of integration between the formal and non-formal educational systems

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Rui Dias[34]
José Carlos Kullberg[35]
Jorge Ferreira[36]
Álvaro M.M. Pinto

Abstract

The Portuguese Olympiad of Geology (POG 2015) is an initiative of the Geological Society of Portugal (SGP), directed to (i) driving the teaching/learning of Geology in secondary education; (ii) shorten the distance between secondary schools and universities; (iii) disclosing Geology as a Science; and (iv) attracting vocations to Earth Sciences. Besides SGP and the Universities that have directly supported the initiative, the POG 2015 relied on the institutional and logistical support provided by the Ministry of Education and Science, the *IGEO* and the *"Ciência Viva"* Network, a national network of Science Centres. The Science Centre of Lousal assured the national secretariat, and all the logistics and dissemination, whereas the Science Centre of Estremoz welcomed the organization and logistics of the Finals. Over 2,500 students from 150 secondary schools have participated in the school phase of the competition. The top three students classified in each school qualified to the regional phase (4 regions), which was attended by about 430 students. Then, the 25 finalists went through a demanding final evaluation with theoretical tests, laboratory and field practice, which ultimately selected the three students who, for the first time, have represented Portugal at the IESO: Vasco Esteves (gold medal), José Pedro Carvalho (bronze medal), and Carolina Esteves (two bronze diplomas; ITFI and ESP). Two mentors have completed the Portuguese team: Jorge Relvas (National Coordinator) and Álvaro Pinto, both from the University of Lisbon. A training program by university professors, coupled with the excellence of the selected students, were the keys to their success in IESO 2015. To stir, to promote, to enhance the teaching of Geology in Portugal, and to capture vocations and attract more and better students to this area of knowledge are the ultimate goals of this initiative. Medals are a prize and a tool, not an end in itself.

Keywords: Portugal, Olympiad, Geology, "Ciência Viva"

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4.14 Russian experience of team preparation for IESO

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Abstract

Earth science in Russian education system are included in geography and physic subjects in secondary school. So geography and physic lessons contain some topics of geology, meteorology, oceanography, astronomy and environmental science. As a result a typical Russian school-student has a relatively low knowledge level of Earth science that is not satisfy the IESO requirements. Preparation of Russian IESO team is based on additional education system. Traditionally in many Russian cities there are a lot of geological, ecological, astronomical, archeological and others clubs and associations for school-students that are keen on science. Usually in such clubs students have theoretical lectures and practical lessons during school year and field trips during vacations. Now many Earth science clubs bring their educational programme into line with IESO syllabus. There are several local and nationwide scientific competitions and Olympiads.

The selection of participants and formation of Russian IESO team occurs at the oldest Geological club in Russia belonging to City Palace of Youth Creativity and at Geology and Geoecology Department of Herzen State University in Saint Petersburg. The algorithm of team selection is following: step 1 – competitions in local clubs, winners go to step 2. Step 2 – annual open competition in Geological club in City Palace of Youth Creativity. Participants take part in live theoretical conversations, tests and practical tasks. Moreover they present their own scientific projects or investigations. 10 winners from tenth grade (usually 16 years old) go to step 3. Step 3 – final selection during the Summer school "Geology and Civilization" at Herzen State University. The candidates listen to lectures, have practical lessons and excursions during 4 days. After that they have three final written tests – geology, meteorology and hydrosphere, astronomy and one practical geological field test near Saint Petersburg. Selection of four winners enables to form the team.

Keywords: additional education, geological school clubs, scince association

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4.15 Spain and IESO: from the beginning to Brazil 2015

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Juan de Dios Centeno[40]
Xavier Juan[41]
Tania Navalpotro[42]
Agustín Senderos[43]

Abstract

AEPECT (the Spanish Earth Science Teachers Association) has been part of the IESO since the Seoul Conference in 2004. However, the 5th IESO in Italy in 2011 saw the first participation of Spain. Since then, we've been in all the IESO editions, including the organization of the 8th Olympiad in Santander, Spain.

The selection of the team members is done in two steps: first, regional Olympiads (February to March), and then a Spanish Olympiad (April). In 2015, 2500 students participated in 35 regional Olympiads and 35 teams took part in the Spanish Olympiad.

The Organizing Committee is coordinated by AEPECT with the support and funding of educational authorities, universities, companies and different Spanish Earth Science institutions and societies.

The funding barely covers for the organization of the regional and national Olympiads and travel expenses for the international one. So far, it has not been possible to train the team students and this is one of the challenges we want to face for the next IESO editions.

The most relevant features of Earth Science teaching in Spain are: a) Geology is compulsory in the secondary compulsory education (12 to 16 years old), embedded in a subject called Biology and Geology; b) Earth Science is an optional subject in the post-compulsory education (17-18 years old); c) Geology and Earth Science teachers are mostly Biology graduates (more than 80%); d) some other Geological contents (especially those related to Science and Technology) are part of a quite controversial compulsory subject for the 17 years old pupils called "Science for the Contemporary World"; d) the political changes in the successive governments have led to constant changes in the curricula; e) along the years, AEPECT and the rest of Geological institutions and societies have gained influence in the design of the Geology curricula.

Keywords: Spanish Olympiad, institutions, cooperation, curriculum, influence

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4.16 History of the Sri Lankan National Earth Science Olympiad Competition and its present status

Ashvin Wickramasooriya[44]

Abstract

The first Sri Lankan National Earth Science Olympiad competition has initiated in 2009. Still Geoscience is not taught as a main subject in school curriculum in Sri Lanka. Therefore, when this competition was initiated in Sri Lanka, there were only thirty eight students representing twenty one schools participated for the competition. In 2009 there was only one examination center was arranged to conduct the examination. There were only simple multiple choice questions related to geography, basic geology, environmental science and astronomy. As this was the first time experience for students and they did not much aware about geology, they did not performed well at the competition. Based on the written examination marks ten students who got the highest marks were interviewed and the best four students were selected to represent Sri Lankan team to participate at the 3rd IESO which was held in Taipei, Taiwan during September, 2009. It was a very useful experience for both students and Sri Lankan Earth Science Olympiad organizers. 3rd IESO can be considered as the turning point of promoting Earth Science Olympiad in Sri Lanka. With the experience gained by attending the 3rd IESO, Sri Lankan National Earth Science Olympiad organizing committee was able to introduce a syllabus and structure of the examination paper for National competition.. The Geological Society of Sri Lanka contribute to publicized the Earth Science Olympiad competition among school teachers and students. After 2009, Sri Lankan National Earth Science Olympiad competition has been organizing as an annual event of the Geological Society of Sri Lanka. It has been observed that the number of candidates participate for this competition increase in each year. At present National competition organizes in nine examination centers covering all nine provinces and twenty four districts of Sri Lanka. Students who performed well at the provincial level competition are interviewed and select the best four students to represent the Sri Lankan team at the International Earth Science Olympiad competition.

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4.17 IESO Participant Students Selection And Preparation In Ukraine

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Abstract

In Ukraine, participation for the IESO is sponsored and managed by the Ministry of Education and Science of Ukraine. There is a general practice of performing annual Olympiads for each secondary school subject beginning from the 7th form (year of studies). These competitions are organized in three rounds, the first being a local one at administrative district level, the second being city or oblast level and the third one – the national competition. Participants for international Olympiads are selected among the winners of national Olympiads.

Since there is no Earth Science subject at schools in Ukraine, IESO participants are selected among the winners of geography Olympiad.

After the winners of the national round of Geography Olympiad are selected, representatives of the Ministry of Education and Science and of one of the leading universities (usually a geography faculty) choose 8 candidates among the top-10 students at the national competition. We select those ones who are stronger in physical geography, have at least some fluency in English.

Those 8 candidates are invited for a training camp, where they have intensive one week courses in geology, meteorology, hydrology and astronomy led by special instructors (university professors) and are prepared for distant training for the following 2 months. Students are offered tests from the previous IESOs and are tutored in accordance with the IESO syllabus. By the end of the camp 4 best candidates are selected who participate in IESO. With these four people instructors maintain communication until their departure for the Olympiad.

Keywords: IESO selection, IESO training, international Olympiad, Ukraine, geography Olympiad

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4.18 The United States IESO Team Selection Process

Elizabeth Tailer
Thomas Tailer[47]

Abstract

The United States Team for the International Earth Science Olympiad starts with nominations of students by a teacher. The teacher does not need to be their current Earth Science teacher. Students who approach the selection committee themselves are asked to get a teacher nomination. Upon payment of $25 US a test package with return envelope is sent on April first to the administration of the students school. The school administration and the nominating teacher must both sign off that their student(s) took the written test with no access to any help either human or electronic. The tests are multiple choice and cover the IESO curriculum content. The top scoring students are invited to attend an IESO preparation summer camp. The cost of the camp is $2,500 per student. Scholarships are available for families in need. The final team is chosen from the top scoring students at the end of the summer camp. Students may attend the camp more than once. Once students have taken the nomination exam, they are mentored by former IESO team USA students. An article and/or advertisement is placed in the National Earth Science Teachers Association journal "The Earth Scientist" each year to inform teachers of the opportunity for their students.

Keywords: IESO team selection, USA

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Cap. 5
IESO 2015

5.1 Participants list

Country:	Category:	Full Name:	Institution:
Argentina	Observer	Jose Selles-Martinez	University of Buenos Aires
Argentina	Observer	Rastellino, Graciela Lidia	QDA
Australia	Observer	Gregory Charles Mcnamara	Australian Science Innovations
Australia	Mentor	Bronte Kay Nicholls	Australian Science Innovations
Australia	Student	Timothy David Hume	Australian Science Innovations
Austria	Mentor	Sabine Seidl	University College of Teacher Education Carinthia
Austria	Mentor	Bernhard Sallay	BG&BRG Villach Peraustraße
Austria	Student	Jasmin Pfeifer	BG/BRG Perau
Austria	Student	Anna Rupp	BG/BRG Perau
Austria	Student	Selina Löschenkohl	HTL Leoben
Austria	Student	Christoph Gruber-Veit	HTL Leoben
Austria	Mentor	Bernhard Sallay	BG & BRG Villach Perausstrasse
Bolivia	Observer	Oscar Saca Ventura	Universidad Mayor de San Simón
Brazil	Student	Geferson Rocha Santos	IFES- Campus Itapina
Brazil	Student	Antônio Vítor Dehet-Many	IFES- Campus Itapina
Brazil	Student	Cláudio De Brito Da Silva	IFES- Campus Itapina
Brazil	Guest Student	Maria Fernanda De Souza Ganja	IFES- Campus Itapina
Brazil	Guest Student	Daiany Gomes Mesquita De Miranda	IFES- Campus Itapina
Brazil	Mentor	Patrícia Soares Furno Fontes	IFES- Campus Itapina
Brazil	Other	Geilson Silva Costa	IFES- Campus Itapina
Brazil	Student	Shéron Luma De Oliveira	IFSULDEMINAS-Campus Inconfidentes
Brazil	Mentor	Cleiton Lourenço De Oliveira	IFSULDEMINAS-Campus Inconfidentes
Brazil	Mentor	Sindynara Ferreira	IFSULDEMINAS-Campus Inconfidentes
Brazil	Other	Luiz Anselmo Costa Nascimento Ifanger	IG Unicamp
France	Mentor	Mathieu Rajchenbach	Sciences à l'Ecole - Paris Observatory - Ministry of Education

France	Mentor	Gérard Bonhoure	Ministry of Education - retired
France	Observer	Elisabeth Bonhoure	Ministry of Education - retired
France	Observer	Alain Doressoundiram	Paris Observatory
France	Observer	Pierre Jauzein	Agence pour l'Enseignement Français à l'Etranger (AEFE)
France	Student	Maxime Legoupil	Ministry of Education - student
France	Student	Clément Astruc	Ministry of Education - student
France	Student	Nicolas Papadopoulos	Ministry of Education - student
France	Student	Adrien Fradet	Ministery of Education - student
France	Mentor	Bonhoure Gerard	EDUCATION NATIONALE
Germany	Mentor	Blondeau Marylin	Französisches Gymnasium
Germany	Student	Leander Adrian Schnee	Französisches Gymnasium Berlin
Germany	Student	Clara Von Hirschhausen	Französisches Gymnasium Berlin
Germany	Guest Student	Leonard Schmitt	Lycée Français de Berlin
Germany	Student	Lukas Hahne	Richard Hallmann Schule
Germany	Student	Lennart Krügel	Richard Hallmann Schule
Germany	Mentor	Dr. Sylke Hlawatsch	Richard Hallmann Schule
India	Student	Tarun Yadav	Delhi Public School, Dwarka
India	Student	Neel Karia	Bhavani Shankar Road Junior College of Science
India	Student	Nachiket Girish	Bhavan's B.P. Vidya Mandir, Civil Lines, Nagpur
India	Student	Kushagra Jain	S.R Public Senior Secondary School
India	Student	Amogh Harsh	Ryan International School
India	Guest Student	Dhruv Walia	Army Public School Shillong
India	Guest Student	Dhruv Walia	Army Public School Shillong
India	Mentor	Hema Achyuthan	Anna University
India	Observer	Narayanswamy Rajendran	Geoilogical society of india, Bangalore
India	Observer	R.h.sawkar	Geoilogical society of india, Bangalore
Indonesia	Mentor	Zadrach Ledoufij Dupe	Dept. of Meteorology, Bandung Institute of Technology

Indonesia	Mentor	Salahuddin Husein	Dept.of Geology, Universitas Gadjah Mada
Indonesia	Observer	Mochamad Ikbal Arifyanto	Dept. of Astronomy, Bandung Institute of Technology
Indonesia	Student	Jason Hartanto	SMAN 1 Sidoarjo
Indonesia	Student	Nanda Adi Kurniawan	SMAN 3 Malang
Indonesia	Student	Abdel Hafiz	SMAN 1 Sumatera Barat
Indonesia	Student	Ryan Setyabudi	SMAN 2 Purwokerto
Indonesia	Observer	Heri Fitriono	Ministry of Education and Culture
Iran	Observer	Maryam Abedini	education and training
Israel	Mentor	Yossi Gudovitch	Ein karem high school
Israel	Mentor	Yossi Gudovitch	Ein karem high school
Israel	Student	Garfunkel Ayelet	Maale shaharoot school
Israel	Student	Itay Gat	Maale shaharoot school
Israel	Student	Lior Fein	Democratic school
Israel	Student	Yuval Katz	Ein karem high school
Israel	Mentor	Hanan Ginat	Maale shaharoot school
Israel	Other	Nir Orion	Weizmann Institute of Science
Italy	Mentor	Susanna Occhipinti	Innocent Manzetti
Italy	Student	Maria Stella Cascone	Liceo G.Galilei
Italy	Student	Marco Malandrone	Liceo Michelangelo
Italy	Student	Marco Lucio Mangiacapre	ISS Bruno-Franchetti
Italy	Student	Alessandro Rosa	Liceo Berto
Italy	Mentor	Piccioni Emanuele	Liceo Scientifico Annesso Convitto Nazionale di Assisi
Japan	Student	Haruyuki Okinaka	Hiroshima Gakuin Senior High School
Japan	Student	Aritsune Tsuji	NADA Senior High School
Japan	Student	Kiyoaki Doi	Hiroshima Gakuin Senior High School
Japan	Student	Takanobu Mogi	Senior High School at Komaba, University of Tsukuba
Japan	Guest Student	Yuma Kakutani	TSU Senior High School
Japan	Mentor	Hidetsugu Taniguchi	Josai University
Japan	Mentor	Teruyuki Maruoka	Graduate School of Life and Environmental Sciences, University of Tsukuba
Japan	Observer	Kenichiro Hisada	Graduate School of Life and Enviromental Sciences,University of Tsukuba

Japan	Observer	Norihito Kawamura	Faculty of Education and Human Studies, Akita University
Japan	Observer	Yoshihiro Tanaka	Tokyo Gakugei University Senior High School
Japan	Observer	Megumi Watarai	Meikei High School
Japan	Observer	Yoshinori Mae	Kinomoto High School
Japan	Observer	Yutaka Takigami	Kanto Gakuen University
Kazakhstan	Student	Kalamkas Zhagyparova	school-gymnasium #4
Kazakhstan	Student	Anelya Tynysbek	school-gymnasium #4
Kazakhstan	Student	Aruzhan Nurulla	school-gymnasium #4
Kazakhstan	Student	Yernur Permebek	school-gymnasium #4
Kazakhstan	Mentor	Zhanat Ismailova	corporate fund "Zhas geolog"
Kazakhstan	Mentor	Altynay Kashkimbayeva	Corporate fund "Zhas geolog"
Kazakhstan	Guest	Kurbanov Niyazbek	Chairman Deputy of The Committee for Geology and Subsoil use of the MINT RK.
Korea (Republic of)	Mentor	Gong Soo Chung	Chungnam National University
Korea (Republic of)	Mentor	Hyeongbin Cheong	Pukyong National University
Korea (Republic of)	Observer	Kyu Seong Cho	Chonbuk National University
Korea (Republic of)	Observer	Jeong Yul Kim	Korea National University of Education
Korea (Republic of)	Observer	Kiyoung Lee	Kangwon National University
Korea (Republic of)	Observer	Kyuho Lee	Gyeongin National University of Education
Korea (Republic of)	Observer	Siek Hyung	Chungbuk National University
Korea (Republic of)	Observer	Haeri Kwon	Korean Earth Science Society
Korea (Republic of)	Observer	Sung Kook Kim	Korea Foundation for the Advancement of Science and Creativity
Korea (Republic of)	Student	Byung Hyun Kim	Gyeonggi Science High School
Korea (Republic of)	Student	Seungbeom Ahn	Kongju National University High School
Korea (Republic of)	Student	Seungwuk Eun	Incheon Science High School
Korea (Republic of)	Student	Seungwon Jung	Gyeonggi Science High School

Korea (Republic of)	Mentor	Gong Soo Chung	Chungnam National University
Korea (Republic of)	Mentor	Hyeong-Bin Cheong	Pukyong National University
Korea (Republic of)	Student	Byung Hyun Kim	Gyeonggi Science High School
Korea (Republic of)	Student	Seung Beom Ahn	Kongju National University High School
Korea (Republic of)	Student	Seung Wuk Eun	Incheon Science High School
Korea (Republic of)	Student	Seung Won Jung	Gyeonggi Science High School
Korea (Republic of)	Observer	Jeong Yul Kim	Korea National University of Education
Korea (Republic of)	Observer	Kyu-Seong Cho	Chonbuk National University
Korea (Republic of)	Observer	Siek Hyung	Chungbuk National University
Korea (Republic of)	Observer	Kiyoung Lee	Kangwon National University
Korea (Republic of)	Observer	Kyuho Lee	Gyeongin National University
Korea (Republic of)	Observer	Sung Kook Kim	Korea Foundation for the Advancement of Science and Creativity
Korea (Republic of)	Observer	Haeri Kwon	Korean Earth Science Society
Malawi	Observer	Yvonne Chasukwa Mwalwenje	
Norway	Student	Lise Stornes Eiane	St. Olav Vg School
Norway	Student	Sigurds Vågslid	Foss Videregående skol
Norway	Student	Ole Wanvik Haugen	Ole Vig videregående skol
Norway	Student	Johannes Karstein Midtbø	Charlottenlund VGS
Norway	Mentor	Sissel Aasheim	Sandnes Videregående skole
Norway	Observer	Ann Mari Husås	Geological Society of Norway
Norway	Mentor	John-Erik Sivertsen	St. Olav secondary school
Pakistan	Mentor	Abrar Alamgir	Alamgir Group Of Companies
Pakistan	Student	Hamza Haider	Aitchison College
Pakistan	Student	Omair Rashid	LGS Johar Town
Pakistan	Student	Zain Ahmed Malik	Lahore Grammar School Defence
Pakistan	Student	Muhammad Ahmad Faruqui	Central High School
Portugal	Mentor	Álvaro Manuel Madureira Pinto	Faculdade de Ciências da Universidade de Lisboa

Portugal	Mentor	Jorge Manuel Rodrigues De Sancho Relvas	Faculdade de Ciências da Universidade de Lisboa / Sociedade Geológica de Portugal
Portugal	Student	José Pedro Moreira De Carvalho	Agrupamento de Escolas de Lousada
Portugal	Student	Vasco Joaquim De Sousa Esteves	Escola Secundária Damião de Goes
Portugal	Student	Carolina Ponte De Oliveira Esteves	Escola Secundária du Bocage
Romania	Other	George-Costin Dobrin	Colegiul National Mircea cel Batran
Romania	Other	Alexandru Zanca	"Mihai Viteazul" National College
Romania	Mentor	Daniela Elisabeta Bogdan	Ministry Of Education And Scientific Research
Romania	Mentor	Catalina Serban	Highschool Gheorghe Lazar
Romania	Student	Alexandra Dima	International Highschool of Computer Science
Romania	Student	Dan Mircea Neagoe	Mircea Cel Batran College
Romania	Student	Maria Velicu	International Highschool of Computer Science
Romania	Student	Tudor Cristian Cozma	Emil Racovita College
Russia	Student	Alexandra Borisenko	Non-state educational private institution «School «Mumi-Troll»
Russia	Student	Mikhail Valinkin	Municipal Education Establishment Lyceum №2
Russia	Student	Daria Diagileva	Perm City Educational Authority Municipal Education Establishment "Comprehensive Secondary School № 50" Specializing in English "Fortune"
Russia	Student	Valentin Kovalev	Lyceum №130 imeni Michaela Alexeevicha Lavrent'eva
Russia	Mentor	Marina Sinai	Herzen University
Russia	Mentor	Marianna Kulkova	Herzen University
Russia	Observer	Eugeny Nesterov	Herzen University
Spain	Mentor	Tania Navalpotro Gordo	Asociación Española Para la Enseñanza de las Ciencias de la Tierra (AEPECT)
Spain	Mentor	Francesc Xavier Juan Pons	INS Sant Quirze
Spain	Observer	Catalina Sureda Carrió	Institut Jaume Balmes
Spain	Student	Helena Ubach Raya	Institut Jaume Balmes
Spain	Student	Jonatan Romero Matos	IES La Arboleda
Spain	Student	Álvaro Álvarez Tomás	IES San Juan de la Cruz

Spain	Student	Marta Prieto Señarís	IES Rosalía de Castro
Spain	Observer	Vicenta Vidal Oller	IES La Patacona
Australia	Student	Zoe Scarlatt Thompson	Australian Science Innovations
Australia	Student	Jade Hoang Pham	Australian Science Innovations
Australia	Student	Sacha Brigitte Mann	Australian Science Innovations
Sri Lanka	Mentor	Ashvin Kamal Wickramasooriya	University of Peradeniya
Sri Lanka	Student	Ihala Gedara Ravini Nimaya Wimalasuriya	Visakha Vidyalaya (College)
Sri Lanka	Student	Liyanage Tharindu Nirmal Wickremasinghe	Nalanda College
Sri Lanka	Student	Poruthotage Varuni Michelle Fernando	Devi Balika Vidyalaya (College)
Sri Lanka	Student	Keragala Arachchilage Sachith Udara Keragala	Trinity College Kandy
Sri Lanka	Mentor	Deegoda Gamage Manel Deegoda	Visakha Vidyalaya
Taiwan	Mentor	Pay-Liam, Lin	National Central University
Taiwan	Mentor	Hsieh-Hai, Fu	National Taiwan Normal University
Taiwan	Student	Kai-Hung, Cheng	National Tainan First Senior High School
Taiwan	Student	Hsing-Hung, Chou	The Affiliated Senior High School of National Taiwan Normal University
Taiwan	Student	Yao-Ting, Hsu	Taipei Municipal Jianguo High School
Taiwan	Student	An-Jun, Liu	Taipei Municipal Jianguo High School
Taiwan	Observer	Chung-Pai, Chang	National Central University
Taiwan	Observer	Meng-Wan, Yeh	National Taiwan Normal University
Taiwan	Observer	Yu-Fen, Chang	None
Taiwan	Observer	Tzu-Yuan, Liao	National Taiwan Normal University
Taiwan	Observer	Hsiu-Feng, Lee	Ministry of Education
Thailand	Mentor	Pachrasu Wannakao	KKU
Thailand	Mentor	Panu Trivej	Kasetsart University
Thailand	Student	Pitchapon Jirawongsapan	Bangkok/christian College
Thailand	Student	Panthon Imemkamon	Triam Udom Suksa School
Thailand	Student	Kunanon Leelahakorn	Suankularb Wittayalai
Thailand	Student	Mr. Patsakorn Tangadulrat	Hatyaiwittayalai School

Thailand	Observer	Sunisa Somsamai	The Institute for the Promotion of Teaching Science and Technology (IPST)
Thailand	Observer	Dr. Utane Sawangwit	National Astronimical Research Institute of Thailand (NARIT)
Ukraine	Mentor	Braychevskyy Yulian	Taras Shevchenko National University of Kyiv
Ukraine	Mentor	Gladkovskyi Roman	Ministry of Education and Science of Ukraine
Ukraine	Student	Bukatiuk Roman	Ivano-Frankivsk Secondary School #25
Ukraine	Student	Kykyna Anhelina	Khust Boarding School
Ukraine	Student	Yevdokymova Oleksandra	Oleksandrivska School of Sumska Municipal Council
Ukraine	Student	Lushchyk Bohdan	Lviv Physics and Maths Boarding School
USA	Mentor	Elizabeth Ann Tailer	UVM Medical Center
USA	Mentor	Thomas Lorillard Tailer	Retired
USA	Student	Ariel Kelly Leong	Ward Melville High School
USA	Student	Catherine Kidder Michael	South Burlington High School
USA	Guest Student	Rylee Roseann Wrenner	Essex Junction High School
USA	Other	Robert Leong	Renaissance Technologies

5.2 Local Organizing Committee

Marcelo Bregagnoli
Roberto Greco
Paula Monteiro
Joarle Magalhães
Cássia Paiva

5.3 Staff

Adriana Dendena
Alan Fialho
Ana Paula Vellela
Camilo Barbosa
Carolina Baldin
Cleiton Hipólito
Cristiano Alves
Dulcimara Nannetti
Eder Sacconi
Eli Toledo
Eliel Segecs
Emanuela Silva
Erika Vilela
Eunice Silva
Fernando Dias
Guilherme Ramalho
Helenice Queiroz
Heliese Pereira
Jane Sanches
Jeancarlos Borges
João Paulo Junqueira
José Hugo De Oliveira
José Luiz De Andrade
Josué Araújo
Juliano Lima
Kelica Souza
Pamela Oliveira
Regiane Magalhães
Renato Almeida
Vanessa Giarola
Yull Heilordt Roa

5.4 Scientific Committe

Alfredo Barreto Luiz
Clibson Alves
Francisco Ladeira
Marcelo Reis
Marcos Gervásio Pereira
Marcus Henriques Da Silva
Michelle Reboita
Nir Orion
Pedro Wagner Gonçalves
R. Shankar
Roberto Marques Neto
Vanessa Carvalho
Melina Souza
Thomaz Alvisi Oliveira
Diego Sardinha

5.5 Volunteers

Bianca de Cássia Garcia
Cristiano Antônio Alves
David Moraes
Flávia Galera
Juliano Zappia
Laura Terena
Lucas Garcia Alves
Luis Anselmo Ifanger
Nicole Gica
Pamela Abilio
Raquel Rodrigues Pinheiro
Rita Fernandes
Samara Bruzadelli
Saulo Estevam Valim Benedetti
Thamiris Santos do Nascimento
Thiago André Balbino
Thiago Carvalho
Vinícius Arcanjo Monteiro

5.6 Official speeches

Speech delivered by Dr. R. Shankar, Chair, Igeo at the Opening Ceremony

I wish to say that it is nice to be here in Brazil again. A warm welcome to all of you, dear Mentors Observers and students, on behalf of the International Geoscience Education Organisation (IGEO) under whose banner the International Earth Science Olympiad (IESO) is organised every year. A special welcome to those countries that are making their debut this year. These are Iran, Pakistan, Bolivia, Kazakhstan South Africa and Malawi. A special welcome to the teams from these countries.

The IESO in Brazil is particularly exciting to me for several reasons. Firstly, for being held in Pocos de Caldas; I visited this place way back in 1988 for an international conference; so it is very nice to be here again. Secondly, the conference that I attended and made a presentation at was held in the same hotel as where we are living now: the Palace Hotel. Is it providence? I do not know... Thirdly, in 2011 I came for a conference in Freiburg. Then I appealed to my Brazilian colleagues to organise IESO in this beautiful country. And lo! We have the IESO happening in Brazil in 2015...

I wish to offer IGEO's compliments and thanks to members of the Organising Committee, members of the Scientific Committee, all the sponsors of this great event and, in particular, to Prof. Marcelo Bregagnoli, another Prof. Marcelo (!), Dr. Chelo from the Ministry of Education, Prof. Roberto Greco, friends and all the people who have toiled to make this event happen in Brazil. International Earth Science Olympiad is not just a competition but it is an event of co-operation, friendship, fellowship and partnership. For Mentors and Observers, I would say that this is a wonderful opportunity to exchange ideas on best practices, best teaching materials, best evaluation methodology and so on and so forth. In fact, we have a one-day program for all this. The 9th edition of IESO is significant because we brought in some profound changes in the way testing is done in IESO and I cherish the hope that we are moving in the right direction. I also hope that it will be intellectually challenging. For me personally, IESO is just a vehicle for promoting Earth Science education and it is a means to popularize and propagate Earth Sciences among common people and parents.

Dear young students from different countries of the world, do not stress out, take IESO as a fun event, enjoy yourselves and learn more about Mother Earth because you are the future of this world. And you have a great role to play in steering the course of global events, how we would move forward in terms of economy, in terms of social development, and in terms of being happy in this world. So, enjoy the program and have a wonderful time in Brazil. I wish all the best to teams of all the countries; do well.

Many thanks to all of you, Ladies and Gentlemen, for your patient hearing. *Obrigado!*

Speech delivered by Dr. Marcelo Bregagnoli, Rector , Ifsuldeminas at the Opening Ceremony

Dear all, good morning, I would like to thank the IFsuldeminas for the organization and all the professor, colleague, teacher that here in Brazil and in all the participants country have contributed to select students and to bring delegation to this event.

To make an edition of the International Earth Science Olimpyad was a great challenge for every one of us, started just seven months ago.

We believe that we will provide to everyone a great competition with important experiences for everybody involved into this moment.

We would like to thank to the organizing and dedicated technical team and also to the several collaborating institutions that helped us to turn this event into reality.

And it's important to say that, to this event happen, there was a huge commitment of the stuff members of the Federal Institute of Education, Science and Technology of the South of Minas Gerais, as well as the unconditional support of the Ministry of Education, through the Secretary of Professional and Technological Education.

As you may know, Brazil, in recent years, has been investing and encouraging children to participate in science competitions inside and outside the country. However, we still have a long way to walk, but what you are going to see here is a dream that we may one day compete with quality in different areas of knowledge in many International Olympics events.

We hope everyone can do your best in this competition, without forgetting that the learning process is not only making tests and participating in competitions, but it's to involve with people from other countries and getting to know their cultures, their knowledge, to learn together.

I hope everyone can enjoy the best of what we have prepared for you and we would like to thank to the International Geoscience Organization for supporting us to organize this great event.

Have a good competition and good luck to all of you!

Marcelo Bregagnoli

Speech delivered by Dr. Roberto Greco, Vice-Chair , Igeo at the Opening Ceremony

Good morning dear partners!

Welcome to Poços de Caldas, Minas Gerais, Brazil.

International Earth Science Olympiad is an Olympiad and is supposed to be a competition and there is competition. We test students in Earth system science, about planet Earth in all his physical aspect so it's related with geology, geosphere, but also hydrosphere all that is related with water, the atmosphere, all its related with air that involve our planet and even the relation of our planet in the solar system. For several decades, scientists trying to be focus and to specialize in a small part of science, but later on they discover it's not possible to study in separate way the planet Earth. We need to bring all our knowledge all together and to have an holistic and systemic approach. So we have a written test that will test all this aspect and even the relation between them and we have a practical test. With the practical test we try to simulate a real research situation. Students have to try to solve some issues, some questions that we have in real field. All that it's about competition.

We have even a part about cooperation, that is really important in IESO and it's specific of this Olympiad not any other Olympiad have this other part. We have two cooperative tests. The International Team Field Investigation (ITFI), formed by team of eight student with different nationality mixed together. They have to act in the field to try to solve a specific research question. And we have Earth System Project (ESP) that is another cooperative activity where students have a more general issue that they could research and try to solve collecting information in the internet and using other resources. In both they have to make a presentation: ITFI will be an oral presentation and in the ESP will be a poster presentation.

Why we have this cooperative activity in our Olympiad? You, students, have study something about paleontology, you know about the deep time of planet Earth, so you know that we are living just in a small part of our planet history and several species before us already extinct and we don't know how many year we last in this planet but maybe this Olympiad with the help of brilliant students as you that could collaborate and cooperate in order to find solution for all problem and issue that challenge our specie like natural hazard, climate change, global growing population, food supply and so on. So the work that attend all of us in the next ten days is competition, there are test, and cooperation. But the really challenge will start when you come at your home, you will be IESO ambassador in order to promote Earth system science and study, research, cooperation about planet Earth. Thank you very much!

Speech delivered by Dr. R. Shankar, Chair, Igeo at the Closing Ceremony

Ola Brazil !!! Eu estou feliz em estar aqui no Brasil. Bem vindo a todos vocês! It is Greek and Latin! So, let me say it in English...

Good Morning,
Ladies and Gentlemen!

Good Morning, Ladies and Gentlemen!

A few months ago, I was looking forward to an email from Roberto, which finally came and I was very relieved. He said that we are going to organize the IESO in Brazil. I sighed a sigh of relief then. Many thanks for that email.

In the past few days, we had a wonderful event here in Pocos de Caldas. I wish to thank, on behalf of the International Geoscience Education Organisation, all the people and all the institutes that have made the IESO possible in Brazil. I would like to heartily congratulate all the medal winners. I want to add that all of you, with medals or no medals, were already winners when you came to Brazil to participate in the IESO. So, my congratulations go to all the students that have come to this edition of IESO. As a teacher, I would urge the students to do whatever they want to do in their lives, to do something that they have a passion for. Then, they will enjoy their work every single day. But as Chair of IGEO, I would say that there are wonderful opportunities if you pursue higher education and careers in Earth Sciences. Wonderful opportunities and very challenging things are there.... Do pursue your interest in Earth Sciences and contribute to the society, contribute to the economy and contribute to Planet Earth. And.... please stay in touch with us.

I would like to thank Prof. Marcelo Bregagnoli, and all the officials from all the institutions for their dedicated efforts. In order to save time, I will not name everyone, but my heartfelt thanks go to every person who made this event possible, to all the supporting and sponsoring organisations. I know it has been a tremendous job to organise this event on such a grand scale, involving multiple tasks with great responsibilities. Many thanks to all the people, including Roberto, my dear friend. Another thing is, Prof. Marcelo passed on a small thing to Ken (Kenichiro Hisada); it is called *maraca*. *Maraca* is a traditional instrument that is used in native American countries in all rituals when they connect with the Earth. As this is symbolic of our Earth Science Olympiad, we thought we will pass it on to Japan. With *maraca* we are also symbolically passing on the responsibilities of organising the next IESO in Japan in August 2016. We look forward to a wonderful and an even more challenging IESO in Japan. Our best wishes to you, Ken. We look forward to closely interacting with you in planning and executing the 10th IESO – the first double digit IESO – in Japan.

It has been a wonderful time for me to be in Brazil for the third time. People here are so warm, hospitable, friendly, caring and helping. I have thoroughly enjoyed your hospitability. Many thanks for that. I look forward to coming back to Brazil for the 4th time and the 5th time and the 6th time. I wish to thank all the Mentors and Observers for their cooperation and understanding in doing the job that we did in the past few days. I thank everyone and say Muito obrigado, Dhanyavad, Shukriya, Merci, Danke schon, Gracias.... Any other translation for thank you? J J Thank you very much.

5.7 Oficial Program

09/13/2015 Sunday	
Mentors and Observers	Students
02:30pm – 08:00pm accreditation - Hotel	
08:00pm Welcome dinner and Cultural show[1]. Country team presentation - Dining room	
09/14/2015 Monday	
Mentors and Observers	Students
07:00am – 08:30am breakfast – Dining room	
09:30am –11:30am Opening Cerimony – Palace Cassino. *use formal or typical dress	
12:00am – 02:00pm Lunch – Dining room	
03:00pm - 07:00pm International Jury Assembly and International jury meeting – Green Hall (Mentors room)	02:30pm - 05:30pm cultural trip – Square of the Apes Departure 2:30pm
08:00pm -09:00pm Dinner – Dining room	07:00pm - 08:00pm Dinner – Dining room
09:00pm - 10:30pm International jury meeting and time for translation – Green Hall (Mentors room)	08:30pm -09:00pm Cultural show – Hotel
09/15/2015 Tuesday	
Mentors and Observers	Students
08:00am-09:00am breakfast – Dining room	06:30am-8:00am breakfast – Dining room
09:30am-01:00pm Earth Science Education meeting and time for translation – Green Hall (Mentors room)	9:00am-11:00am Cultural trip - Christ the Redeemer Departure:8:30am
01:00pm-02:00pm Lunch – Dining room	11:30am-12:30pm Lunch – Dining room
03:00pm-07:00pm Earth Science Education meeting – Green Hall (Mentors room)	1:30Pm-5:30Pm Written test – Blue Hall (Students room) *use uniform shirt
08:00pm-09:00pm Dinner – Dining room	07:00pm-08:00pm Dinner – Dining room
Free time	08:30-09:00pm Cultural Show- Hotel

09/16/2015 Wednesday	
Mentors and Observers	Students
08:00am-08:30am breakfast – Dining room	06:30am-8:00am breakfast – Dining room
9:00am-06:00pm Visit IFSULDEMINAS (Muzambinho and Machado) Departure: 9:00am	08:00am-11:30am Practical test training Blue Hall (Students room)
	11:30am- 12:30pm Lunch – Dining room
	01:00pm-05:30pm International Team Field Investigation (ITFI) Departure 12:45pm
08:00pm-09:00pm Dinner – Dining room	07:00pm-08:00pm Dinner – Dining room

09:30pm-11:00pm Earth Science Education meeting – Green Hall Mentors room	07:00pm-11:00pm ITFI preparation – Blue Hall (Students room)
09/17/2015 Thursday	
Mentors and Observers	Students
08:00am-09:00am breakfast – Dining room	06:30am-07:30am breakfast – Dining room
09:30am-11:30am Cultural trip[2] Departure: 09:30	08:30am-11:30am Pratical test Departure:8:00am *use uniform shirt
11:30am-12:30pm Lunch – Dining room	12:30am-13:20pm Lunch – Dining room
Free time	01:30pm-05:30pm Pratical test Departure: 1:30 pm *use uniform shirt
07:30pm-08:30pm Dinner – Dining room	06:00pm-07:00pm Dinner – Dining room
09:00pm-10:00pm Cultural show – Hotel	07:15pm-09:00pm Pratical test – Blue Hall (Students room)
09/18/2015 Friday	
Mentors and Observers	Students
06:30am-07:30am breakfast – Dining room	
08:30am-11:30am Visit Local Schools (IFSULDEMINAS campus Poços de Caldas) Departure: 8:00 am	
12:00pm-02:00pm Lunch – Dining room	
Free time	02:30pm-06:00pm Earth Science Project (ESP) Blue Hall (Students room)
07:00pm-09:00pm Dinner – Dining room	
09:00pm-11:00pm International Jury Assembly Green Hall Mentors room	08:00pm-11:00pm ESP Presentation preparation Blue Hall (Students room)
09/19/2015 Saturday	
Mentors and Observers	Students
06:30am-09:00am breakfast – Dining room	
09:00am-12:00pm ITFI and ESP presentation - Green and Blue Hall (Students and Mentors room)	
12:00pm-02:00pm Lunch – Dining room	
03:00pm-04:00pm Plenary Conference – Palace Cassino	
07:00pm-10:00pm Farewell dinner and cultural show	
09/20/2015 Sunday	
Mentors and Observers	Students
07:00am-08:30am breakfast – Dining room	
8:00am-9:30am Award and Closing Ceremony – Palace Cassino *use formal or typical dress	
10:30am-12:30pm Lunch – Dining room	
11:00am, 11:30am, 12:00am Departure - Bus to the airport	

Day 1

09/13/2015 Sunday	
Mentors and Observers	Students
02:30pm – 08:00pm accreditation - Hotel	
08:00pm Welcome dinner and Cultural show[1]. Country team presentation - Dining room	


IESO2015

Day 2

09/14/2015 Monday	
Mentors and Observers	Students
07:00am – 08:30am breakfast – Dining room	
09:30am –11:30am Opening Cerimony – Palace Cassino. *use formal or typical dress	
12:00am – 02:00pm Lunch – Dining room	
03:00pm - 07:00pm International Jury Assembly and International jury meeting – Green Hall (Mentors room)	02:30pm - 05:30pm cultural trip – Square of the Apes Departure 2:30pm
08:00pm -09:00pm Dinner – Dining room	07:00pm - 08:00pm Dinner – Dining room
09:00pm - 10:30pm International jury meeting and time for translation – Green Hall (Mentors room)	08:30pm -09:00pm Cultural show – Hotel


9th International
Earth Science
Olympiad


CAPOEIRA

Day 3

09/15/2015 Tuesday	
Mentors and Observers	Students
08:00am-09:00am breakfast – Dining room	06:30am-8:00am breakfast – Dining room
09:30am-01:00pm Earth Science Education meeting and time for translation – Green Hall (Mentors room)	9:00am-11:00am Cultural trip - Christ the Redeemer Departure:8:30am
01:00pm-02:00pm Lunch – Dining room	11:30am-12:30pm Lunch – Dining room
03:00pm-07:00pm Earth Science Education meeting – Green Hall (Mentors room)	1:30Pm-5:30Pm Written test – Blue Hall (Students room) *use uniform shirt
08:00pm-09:00pm Dinner – Dining room	07:00pm-08:00pm Dinner – Dining room
Free time	08:30-09:00pm Cultural Show- Hotel

Day 4

09/16/2015 Wednesday	
Mentors and Observers	Students
08:00am-08:30am breakfast – Dining room	06:30am-8:00am breakfast – Dining room
9:00am-06:00pm Visit IFSULDEMINAS (Muzambinho and Machado) Departure: 9:00am	08:00am-11:30am Practical test training Blue Hall (Students room)
	11:30am- 12:30pm Lunch – Dining room
	01:00pm-05:30pm International Team Field Investigation (ITFI) Departure 12:45pm
08:00pm-09:00pm Dinner – Dining room	07:00pm-08:00pm Dinner – Dining room
09:30pm-11:00pm Earth Science Education meeting – Green Hall Mentors room	07:00pm-11:00pm ITFI preparation – Blue Hall (Students room)

Day 5

09/17/2015 Thursday	
Mentors and Observers	Students
08:00am-09:00am breakfast – Dining room	06:30am-07:30am breakfast – Dining room
09:30am-11:30am Cultural trip[2] Departure: 09:30	08:30am-11:30am Pratical test Departure:8:00am *use uniform shirt
11:30am-12:30pm Lunch – Dining room	12:30am-13:20pm Lunch – Dining room
Free time	01:30pm-05:30pm Pratical test Departure: 1:30 pm *use uniform shirt
07:30pm-08:30pm Dinner – Dining room	06:00pm-07:00pm Dinner – Dining room
09:00pm-10:00pm Cultural show – Hotel	07:15pm-09:00pm Pratical test – Blue Hall (Students room)












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Day 6

09/18/2015 Friday	
Mentors and Observers	Students
06:30am-07:30am breakfast – Dining room	
08:30am-11:30am Visit Local Schools (IFSULDEMINAS campus Poços de Caldas) Departure: 8:00 am	
12:00pm-02:00pm Lunch – Dining room	
Free time	02:30pm-06:00pm Earth Science Project (ESP) Blue Hall (Students room)
07:00pm-09:00pm Dinner – Dining room	
09:00pm-11:00pm International Jury Assembly Green Hall Mentors room	08:00pm-11:00pm ESP Presentation preparation Blue Hall (Students room)


BEM-VINDOS
ALUNOS DA
IESO
IESO STUDENTS
WELCOME TO CAIÇ/
HAVE A NICE STAY!

Day 7

09/19/2015 Saturday	
Mentors and Observers	Students
06:30am-09:00am breakfast – Dining room	
09:00am-12:00pm ITFI and ESP presentation – Green and Blue Hall (Students and Mentors room)	
12:00pm-02:00pm Lunch – Dining room	
03:00pm-04:00pm Plenary Conference – Palace Cassino	
07:00pm-10:00pm Farewell dinner and cultural show	


IESO2015


9th International
Earth Science
Olympiad

Day 8

09/20/2015 Sunday	
Mentors and Observers	Students
07:00am-08:30am breakfast – Dining room	
8:00am-9:30am Award and Closing Ceremony – Palace Cassino *use formal or typical dress	
10:30am-12:30pm Lunch – Dining room	
11:00am, 11:30am, 12:00am Departure - Bus to the airport	


Earth Scienc
Olympiad
13th to 20

5.8 Final ranking – Medals list

Country	Name	Medals
Korea (Republic of)	Seung Won Jung	Gold
Indonesia	Abdel Hafiz	Gold
Taiwan	Kai-Hung, Cheng	Gold
Portugal	Vasco Joaquim de Sousa Esteves	Gold
Australia	Zoe Scarlatt Thompson	Gold
Korea (Republic of)	Seung Wuk Eun	Gold
Thailand	Pitchapon Jirawongsapan	Gold
Japan	Aritsune Tsuji	Gold
India	Neel Karia	Gold
Taiwan	Yao-Ting, Hsu	Silver
France	Adrien Fradet	Silver
Romania	Dan Mircea Neagoe	Silver
Japan	Kiyoaki Doi	Silver
Taiwan	An-Jun, Liu	Silver
Australia	Timothy David Hume	Silver
Taiwan	Hsing-Hung, Chou	Silver
Indonesia	Jason Hartanto	Silver
Italy	Marco Malandrone	Silver
Russia	Alexandra Borisenko	Silver
Italy	Maria Stella Cascone	Silver
Korea (Republic of)	Seung Beom Ahn	Silver
Australia	Sacha Brigitte Mann	Silver
France	Clément Astruc	Silver
Romania	Alexandra Dima	Silver
Korea (Republic of)	Byung Hyun Kim	Silver
Indonesia	Nanda Adi Kurniawan	Silver
Thailand	Patsakorn Tangadulrat	Bronze
Japan	Takanobu Mogi	Bronze
Thailand	Panthon Imemkamon	Bronze
India	Tarun Yadav	Bronze
Spain	Jonatan Romero Matos	Bronze
Japan	Haruyuki Okinaka	Bronze
Portugal	José Pedro Moreira De Carvalho	Bronze
India	Kushagra Jain	Bronze
Indonesia	Ryan Setyabudi	Bronze
Russia	Valentin Kovalev	Bronze
Norway	Johannes Karstein Midtbø	Bronze
Usa	Ariel Kelly Leong	Bronze

France	Nicolas Papadopoulos	Bronze
Kazakhstan	Kalamkas Zhagyparova	Bronze
Norway	Lise Stornes Eiane	Bronze
Israel	Lior Fein	Bronze
Russia	Daria Diagileva	Bronze
Sri Lanka	Liyanage Tharindu Nirmal Wickremasinghe	Bronze
Thailand	Kunanon Leelahakorn	Bronze
Romania	Tudor Cristian Cozma	Bronze
Italy	Alessandro Rosa	Bronze
Italy	Marco Lucio Mangiacapre	Bronze
Spain	Spain Helena Ubach Raya	Bronze
Israel	Itay Gat	Bronze
Ukraine	Bukatiuk Roman	Bronze
Germany	Leander Adrian Schnee	Bronze
Austria	Christoph Gruber-Veit	Bronze
Brazil	Cláudio De Brito Da Silva	Bronze

5.9 Written Test

The 9th International Earth Science Olympiad Pocos de Caldas – Brazil

September, 2015

1. The rock unit in the picture below consists of rounded grains ranging in size from sand to small pebbles. In which sedimentary environment did this rock form? (Correct answer = 1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. Dune
b. River
c. Lake
d. Beach

2. The surface wind is a result of the balance between the pressure gradient force, Coriolis force, and frictional force. If the surface wind blows from west to east in the Northern Hemisphere, in which direction would the pressure gradient force point? (Correct answer = 1 point)

a. Northeast
b. Southeast
c. Southwest
d. Northwest

3. Choose the correct description for the evidence that the Earth's outer core is liquid. (Correct answer = 1 point)

a. In some places, the first arriving seismic waves are refracted waves instead of direct waves.
b. There is a seismic shadow zone.
c. S-waves do not reach the opposite side of an epicenter.
d. Weak P-waves are detected in the P-wave shadow zone.

4. The figure below shows the global mean surface temperature anomaly and the 5-year running mean. The green bars show uncertainty estimates. The Earth's temperature has remained relatively constant for the past 15 years. Which one of the following options would possibly cause this warming slowdown (or warming pause)? (Correct answer = 1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. Amount of cirrus cloud cover and an increase in the amount of water vapor
b. Concentration of tropospheric ozone has increased
c. An increase in the number of sunspots
d. The frequency of La Nina events has increased.

5. According to the Big Bang theory, approximately how many years ago was the universe at a very high density state and then expanded? (Correct answer = 0.5 point)

a. 130×10^6
b. 1.3×10^9
c. 13.8×10^9

d. 138 x 10^9

6. Which of the following statements is correct and only related to the study of seismic waves that pass through the Earth and based on rock rheology characteristics (the response of rock to stress)? (Correct answer = 1 point)

a. The asthenosphere lies entirely within the mantle and behaves in a semi-fluid (plastic) manner on which the lithosphere slips.
b. The theory of plate tectonics states that the crust is segmented into several pieces of a spherical jigsaw puzzle.
c. The crust and the outermost mantle comprise the asthenosphere that behaves plastically.
d. The crust and mantle define a plate that moves relative to one another by floating on and gliding over the liquid outer core.

7. The figures below represent two different types of cyclones. Which of the statements below is correct? (Correct answer = 1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. Fig. 1 cyclone forms over cold tropical water.
b. Fig. 2 cyclone gains energy from condensation.
c. Fig. 1 cyclone is caused by upper air convergence.
d. Fig. 2 cyclone has boundaries separating air masses of different temperatures.

8. Which of the statements below describe the interaction among $CaCO_3$, CO_2 and H_2O? (EACH correct answer = 1 point; EACH wrong answer = -1 point)

a. The formation of limestone.
b. The dissolution of limestone.
c. The interaction between atmosphere and geosphere.
d. The interaction among biosphere, hydrosphere and geosphere.

9. How many years ago did the solar system form due to the gravitational collapse of a giant interstellar molecular cloud? (Correct answer = 0.5 point)

a. 46 x 10^6
b. 460 x 10^6

e. 4.6×10^9
f. 46×10^9

10. If a massive formation of stalactites takes place in caves, which of the statements below describe the outcome? (EACH correct answer = 1 point; EACH wrong answer = -1 point)

a. Accelerate the present climate change.
b. Slow down the present climate change.
c. Accelerate the precipitation rate of limestone in the ocean.
d. Slow down the precipitation rate of limestone in the ocean.

11. The figure below shows the annual mean of solar (shortwave) and terrestrial (long-wave) radiation. In the tropics, incoming solar radiation exceeds the outgoing terrestrial radiation and, hence, a surplus of energy exists. The reverse holds good for the high latitudes. Thus, tropical surplus heat should be transferred towards the poles to balance the energy budget. Which one of the following statements does NOT reduce the latitudinal energy imbalance? (Correct answer = 1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. Hurricanes (typhoons) move poleward.
b. Cold currents flow towards the equator
c. Atmospheric circulation in the mid-latitudes
d. Cyclones develop in mid-latitudes

12. For a given gas, a decrease in temperature increases its solubility in water. How will global warming influence the carbonate rocks on Earth? Choose the correct statement below. (Correct answer = 1 point)

a. It will only increase the dissolution of limestone.
b. It will increase the dissolution of all the carbonate rocks.

c. It will have no effect on the dissolution or formation of carbonate rocks.
d. It will increase the formation of carbonate rocks.

13. The figure below shows the distribution of the Hawaiian and Emperor chains with the geological age of volcanic rocks (unit: 106 years). What is the velocity of the Pacific plate movement at present on the basis of this distribution? Choose the correct statement from the list below: (Correct answer = 1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. 6 cm/year
b. 60 cm/year
c. 3 cm/year
d. 30 cm/year

14. Which of the statements below describe the outcome of the increase of CO_2 in the atmosphere? (EACH correct answer = 1 point; EACH wrong answer = -1 point)

a. A decrease in the formation of $CaCO_3$ in the oceans.
b. The formation of $CaCO_3$ in the oceans.
c. Acidification of the oceans.
d. An increase in the growth of coral reefs.

15 –16. The following paragraph (concerning sunspots) contains numbered blanks. Please match the numbered blanks with the correct letters from the word bank provided below. (Correct answer = 0.5 point)

A sunspot is a relatively colder part on the sun's surface. The number of sunspots typically changes with a periodicity of **(15)** years; solar activity is **(16)** when there are many sunspots.
Word bank:
(a) 11 (b) 110 (c) 1100 (d) low (e) high (f) constant

Blank number in the paragraph	The matching letter from the word bank
15	
16	

17. How many times bigger is the diameter of the Sun compared to that of the Earth? (Correct answer = 0.5 point):

a. About 100 times
b. About 1,000 times
c. About 10,000 times
d. About 100,000 times

18. Both the figures below show medium-grained sandstone. Figure (1) shows horizontal lamination and Figure (2) shows ripple cross-lamination. Choose the correct answer that explains these sedimentary structures? (Correct answer = 1 point).

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. The water depth to form sedimentary structure (2) is deeper than that to form sedimentary structure (1).
b. Sedimentary structure (2) is formed in a delta.
c. Sedimentary structure (1) is formed by the settling of grains in water.
d. Sedimentary structure (1) requires water flow of a higher velocity when compared to that needed for sedimentary structure (2).

19. The following figure shows the inferred changes in the concentration of atmospheric carbon dioxide and temperature during the past 160,000 years. Choose the correct answers to explain the geologic processes related to this figure. (EACH correct answer = 1 point; EACH wrong answer = -1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. The high concentration of atmospheric CO_2 at present is mainly caused by global warming.
b. Ocean acidification is expected and already recorded at present due to an increase of atmospheric CO_2.
c. Development of glaciers in polar regions is expected when the atmospheric CO_2 concentration is below 220 ppm.
d. Dissolution of limestone exposed on continents is thought to have occurred more effectively 20,000 years ago than 120,000 years ago.

20. Diagrams A and B show the development pattern of sequences in a coast-to-continental shelf setting. Choose the correct answer to explain the balance between the rate of sea level rise and the rate of sediment supply to the sea to form the sequences in (A) and (B). (Choose the correct answer = 1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. In section A: rate of sea level rise = rate of sediment supply
In section B: rate of sea level rise < rate of sediment supply
b. In section A: rate of sea level rise > rate of sediment supply
In section B: rate of sea level rise = rate of sediment supply
c. In section A: rate of sea level rise > rate of sediment supply
In section B: rate of sea level rise < rate of sediment supply
d. In section A: rate of sea level rise < rate of sediment supply
In section B: rate of sea level rise >rate of sediment supply

21. The Sun produces nuclear fusion by converting _____. (Correct answer = 0.5 point)

a. Helium to Hydrogen,
b. Hydrogen to Lithium,
c. Helium to Carbon,
d. Hydrogen to Helium

22. A hydrograph shows the rate of flow (discharge) versus time past a specific point in a river. The unit cms is cubic meters per second. Figure (a) is a hydrograph showing the typical lag between the time when most of the rainfall occurs and the time when the stream floods. "A" in the hydrographs below represents a factor which influences lag time. In Figure (b) there is a decrease in lag time with the same amount of rainfall as in figure (a). What is the correct reason for this decrease? (Correct answer = 1 point).

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. Construction of upstream retention ponds
b. Storm
c. Urbanization
d. Restoration of catchment forestation

23. Which of the statements below correctly describes the outcome of the formation of limestone and chalk? (Correct answer = 1 point)

a. An increase in the amount of CO_2 in the hydrosphere and in the atmosphere.
b. An increase in the amount of CO_2 in the atmosphere only.
c. A decrease in the amount of CO_2 in the atmosphere and in the hydrosphere.
d. A decrease in the amount of CO_2 in the hydrosphere only.

24. The green line in the graph below presents the chlorophyll content (water depth-wise) in the Gulf of Aqaba (latitude 29°). Which of the items below is related to the high amount of chlorophyll at shallow depth (~ 100 m)? (Correct answer = 1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. The concentration of CO_2 in the atmosphere
b. The sun light and water
c. The salinity of the water
d. The amount of nitrate and phosphate

25. Which of the options below do NOT reflect the interrelationships between the earth systems in the formation of limestone and chalk? (EACH correct answer = 1 point; EACH wrong answer = -1 point)

a. Geosphere, atmosphere, hydrosphere and biosphere.
b. Only the geosphere, atmosphere and hydrosphere.
c. Only the biosphere, hydrosphere and geosphere.
d. Only the biosphere, atmosphere and geosphere.

26. What is the average surface temperature of the Sun? (Correct answer = 0.5 point)

a. 3750 °C
b. 4750°C
c. 5750°C
d. 6750°C
e. 7750°C

27 – 40. The following paragraph (concerning our solar system) contains numbered blanks. Please match the numbered blanks with the correct letters from the word bank provided below. (Each correct answer = 0.5 point)

The four inner planets - Mercury, Venus, Earth and Mars - are called (27), which are made up of (28) and (29). The four outer planets are (30). Jupiter and Saturn, are (31), and are mainly composed of (32) and (33). Uranus and Neptune are (34), and are mainly composed of (35), (36) and (37). Smaller objects also exist in the Solar System, mostly between (38) and (39), which is called (40).

Word bank:

Rock	m) Ice giants
b) Ice giant	n) Scattered disc
c) Methane	o) Water
d) Mars	p) Venus
e) Neptune	r) Saturn
f) Kuiper belt	s) Ammonia
g) Metal	t) Earth
h) Hydrogen	u) Uranus
i) Helium	v) Gas giants
j) Giant planets	w) Asteroid belt
k) Mercury	x) Rocky planets
l) Jupiter	y) Planetesimals

Blank number in the paragraph	The matching letter from the word bank
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	

37	
38	
39	
40	

41. Which of the options below is the correct order of the size of carbon reservoirs on Earth? (Correct answer = 1 point).

a. Atmosphere (the largest).
Biosphere
Hydrosphere
Geosphere (the smallest)
b. Atmosphere (the largest).
Biosphere
Geosphere
Hydrosphere (the smallest)
c. Biosphere (the largest).
Atmosphere
Geosphere
Hydrosphere (the smallest)
d. Geosphere (the largest).
Atmosphere
Biosphere
Hydrosphere (the smallest)
e. Geosphere (the largest).
Hydrosphere
Biosphere
Atmosphere (the smallest)

42. Which of the following statements is true about the conditions under which carbonate sedimentation occurs in oceans? (Correct answer = 1 point).

a. The formation of carbonate sediments is promoted through respiration of living organisms.
b. Carbonate sedimentation is relatively high in oceans with conditions for rapid photosynthesis.
c. Oceanic carbonate sediments are primarily derived from the erosion of limestone deposits in continents.
d. Carbonate sedimentation is relatively high in warmer oceans.

43. Which of the pathways (1-7 in the diagram below) cannot occur in nature? (Correct answer = 1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. 1
b. 2
c. 3
d. 4
e. 5
f. 6
g. 7

44. While walking in a mountain range, you find a fossil reef in a limestone layer. What might you conclude based on this field observation? (Correct answer = 1 point)

a. It is most likely that this area was an ancient deep ocean floor.
b. It is most likely that this area was a continental shelf located in an area with rather warm water.
c. It is most likely that this area was a continental shelf located in a rather cold area.

d. It is most likely that this area was a former continental slope beneath which detrital sediments have been accumulating.

45 - 47. In the photograph below, the darker units are metamorphic rocks with some igneous intrusions and the lighter unit consists of limestone, dolomite, chalk and chert. Question numbers 45, 46 and 47 are related to this photograph.

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

45. Which of the structures below is most likely the reason for this appearance of the rocks units? (Correct answer = 1 point)

a. Syncline
b. Anticline
c. Horst
d. Graben

46. What are the geologic processes that took place in the area? Choose the correct answers. (EACH correct answer = 1 point, EACH wrong answer = -1 point)

a. Sedimentation
b. Metamorphism
c. Volcanic eruptions
d. Magmatic intrusions
e. Erosion
f. Chemical weathering
g. Lithification
h. Melting
i. Burial
j. Uplift

47. Which of the sequences given below best describes the order of the geological processes that took place in the area? (Correct answer = 1 point)

a. Metamorphism, erosion, magmatic intrusions, sedimentation, erosion.
b. Metamorphism, magmatic intrusions, erosion, sedimentation, erosion.
c. Metamorphism, sedimentation, magmatic intrusions, erosion.
d. Metamorphism, magmatic intrusions, volcanic eruptions, sedimentation, erosion.

48. The graph below depicts the changes of atmospheric CO_2 concentration and the pH of the Pacific Ocean water. The measurements were made in Hawaii from 1990 to 2008. Based on the graph, mark the correct statements in the list below.(EACH correct answer = 1 point; EACH wrong answer = -1 point)

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

a. When the pH increases, CO_2 is released from the ocean to the atmosphere.
b. Global warming causes an increase in atmospheric CO_2 concentration and the ocean water becomes more acidic.
c. When atmospheric CO_2 concentration increases, CO_2 gets into the ocean and the ocean water becomes more acidic.
d. If only the atmospheric CO_2 concentration was increasing and the oceanic pH was constant, global warming would be more rapid.
e. If only atmospheric CO_2 concentration was increasing and the oceanic pH was constant, global warming would be slower.
f. An increase in oceanic CO_2 concentration can affect coral reefs.
g. The annual variation of the atmospheric CO_2 concentration is a result of biological activity.

h. The common explanation for the increase of atmospheric CO_2 concentration is human activity, mostly fossil fuel burning and forest fires.
i. The atmospheric CO_2 data shown represent only the changes in the Pacific Ocean.

49. What is the dated age of the rocks in which the first evidence of life forms appeared? (Correct answer = 0.5 point):

a. Approximately 380 x 10^6 years ago.
b. Approximately 550 x 10^6 years ago.
c. Approximately 3.8 x 10^9 years ago.
d. Approximately 4.6 x 10^9 years ago.

50. Which of the statements below correctly describe the change in the CO_2 concentration in the primitive atmosphere of the Archaean Earth? (EACH correct answer = 1 point; EACH wrong answer = -1 point):

a. Increased following the appearance of life on earth.
b. Decreased following the appearance of photosynthetic organisms.
c. Decreased following the formation of calcium carbonate by living organisms.
d. Increased following the formation of calcium carbonate by living organisms.
e. Decreased following the weathering of igneous minerals.
f. Increased following the weathering of igneous minerals.

51 - 52. The following paragraph (concerning the Sun) contains numbered blanks. Please match the numbered blanks with the correct letters from the word bank provided below. (Correct answer = 0.5 point)

The Sun ejects charged particles, referred to as (51), with the speed of several (52) of km/s

Word bank:
a. Corona
b. Solar wind
c. Solar flare
d. Tens
e. Hundreds
f. Thousands
g. Ten thousands

Blank number in the paragraph	The matching letter from the word bank
51	
52	

53 – 56.The following paragraph contains numbered blanks. Please match the numbered blanks with the correct letters from the word bank provided below. (Correct answer = 0.5 point)
Fossils of (53), which derive energy through (54), existed in the ocean and produced (55). This created (56) in the Archaean oceans.

Word bank:

a. Cyanobacteria
b. Burgess Shale
c. Oxygen
d. Brachiopoda
e. Zooplankton
f. Nickel ore
g. Photosynthesis
h. Trilobites
i. Uranium ore
j. Stromatolites
k. Nitrogen
l. Banded Iron Formation
m. Crinoids

Blank number in the paragraph	The matching letter from the word bank
53	
54	
55	
56	

57. Which of the statements below correctly describe the tendency of weathering of feldspars? (EACH correct answer = 1 point; EACH wrong answer = -1 point)

a. Decreases the amount of CO_2 in the atmosphere.
b. Increases the amount of CO_2 in the atmosphere.
c. Enhances the acidification of the oceans.
d. Limits the acidification of the oceans.
e. Increases the formation of calcium carbonate.
f. Decreases the formation of calcium carbonate.

58 – 59. The cross section below represents terraces in a desert. The terraces were dated and their ages are presented in the figure.

Figure available on this link: https://www.ieso-info.org/test-from-the-ieso-past-editions/

Question numbers 58 and 59 are related to this diagram.
58. What is the rate of deposition in the older terrace? (Correct answer = 1 point)

a. One meter in 1000 years.
b. One meter in 100 years.
c. One meter in 300 years.
d. Three meters in 1000 years.

59. What can be the reasons for the incision of the valley? Choose the correct answers. (EACH correct answer = 1 point; EACH wrong answer = -1 point)

a. Change in the base level.
b. Climate became drier.
c. Climate became wet.
d. Changes in the drainage basin over time.

60 – 67.The following paragraph (concerning the Earth's early evolution) contains numbered blanks. Please match the numbered blanks with the correct letters from the word bank provided below. (Correct answer = 0.5 point)

The Earth formed (60) years ago by accretion from the solar nebula. The early Earth was (61) from the surface to the core and heavy (62) sunk, leading to the formation of the (63). The surface was covered with a (64) and volcanic outgassing created the primordial atmosphere with (65) oxygen. Then Earth cooled and formed a crust, with the ocean at the surface. This is the beginning of the (66) age, which occupies the (67) span of time in the Earth's history.

Word bank:

a) hydrogen	l) iron
b) oxygen	m) mantle
c) reductive	n) core
d) nitrogen	o) magma ocean

e) water	p) set of plates
f) 460 x 106	q) plenty of
g) 4.6 x 109	r) no
h) 46 x 109	s) smallest
i) solid	t) largest
j) molten	u) Cambrian
k) silicon	v) Precambrian

Blank number in the paragraph	The matching letter from the word bank
60	
61	
62	
63	
64	
65	
66	
67	

5.10 Answers Written Test

Question	Answers	Question	Answers	Question	Answers
1	B	23	A	45	A or D
2	A	24	B	46	A B D E F G H I J
3	C	25	B C D	47	B
4	D	26	C	48	C D F G H
5	C	27	X	49	C
6	A	28	A or O	50	B C E
7	B	29	O or A	51	B / C
8	B C D	30	J	52	ED / EF
9	E	31	V	53	A
10	B D	32	H or I	54	G
11	C	33	I or H	55	C
12	B	34	M	56	L
13	A	35	O or S or C	57	A D
14	A C	36	O or S or C	58	A
15	A	37	O or S or C	59	A B D
16	E	38	D or L	60	G
17	A	39	L or D	61	J
18	D	40	W	62	L
19	B and C	41	E	63	N
20	C	42	D	64	O
21	D	43	C	65	R
22	C	44	B	66	V
				67	T

Answer to the written test IESO 2015

5.11 Percentage of right answers of the written test

Quesion 1			
Answer	**Students**		
a	18		
b	51	56%	
c	3		
d	18		
bc	1		
Total	91		
Question 2			
Answer	**Students**		
a	60	66%	
b	15		
c	8		
d	7		
Without answer	1		
Total	91		
Question 3			
Answer	**Students**		
a	13		
b	29		
c	44	48%	
d	4		
Without answer	1		
Total	91		
Question 4			
Answer	**Students**		
a	22		
b	17		

c	25		
d	23	25%	
Without answer	4		
Total	91		
Question 5			
Answer	**Students**		
a	3		
b	7		
c	78	86%	
d	3		
Total	91		
Question 6			
Answer	**Students**		
a	64	70%	
b	9		
c	13		
d	5		
Total	91		
Question 7			
Answer	**Students**		
a	13		
b	47	52%	
c	22		
d	9		
Total	91		

Question 8			
Answer	**Students**		
a	3		
b	17	19%	
c	2	2%	
d	5	5%	Legend:
ab	5		3 right answers
ac	2		2 right answers
ad	6		1 right answer
bc	7	8%	
bd	28	31%	
abd	8		
bcd	3	3%	
acd	1		
abcd	4		
Total	91		
Question 9			
Answer	**Students**		
a	3		
b	1		
c	79		
d	4		
e	1	1%	
f	3		
Total	91		
Question 10			
Answer	**Students**		
a	5		
b	14	15%	Legend:
c	7		2 right answers
d	6	7%	1 right answer

ac	7		
ad	17		
bc	11		
bd	16	18%	
Without answer	8		
Total	91		
Question 11			
Answer	**Students**		
a	14		
b	7		
c	27	30%	
d	41		
Without answer	2		
Total	91		
Question 12			
Answer	**Students**		
a	6		
b	36	40%	
c	7		
d	41		
Without answer	1		
Total	91		
Question 13			
Answer	**Students**		
a	60	66%	
b	5		
c	17		
d	8		

Without answer	1		
Total	91		
Question 14			
Answer	**Students**		
a	4	4%	
b	2		Legend:
c	9	10%	2 right answers
ac	45	49%	1 right answer
bc	22		
bd	3		
bcd	4		
Without answer	2		
Total	91		
Question 15			
Answer	**Students**		
a	70	77%	
b	14		
c	4		
f	1		
Without answer	2		
Total	91		
Question 16			
Answer	**Students**		
a	0		
b	0		
c	0		
d	48		

e	41	45%	
Without answer	2		
Total	91		
Question 17			
Answer	**Students**		
a	44	48%	
b	16		
c	19		
d	12		
Total	91		
Question 18			
Answer	**Students**		
a	5		
b	12		
c	45		
d	28	31%	
Without answer	1		
Total	91		
Question 19			
Answer	**Students**		Legend:
a	2		2 right answers
ab	11		1 right answer
abc	3		
abcd	2		
abd	2		
ac	2		
ad	1		
b	14	15%	

bc	35	38%	
bcd	3		
bd	8		
c	2	2%	
cd	3		
d	1		
Without answer	2		
Total	91		
Question 20			
Answer	**Students**		
a	11		
b	8		
c	54	59%	
d	12		
cd	2		
Without answer	4		
Total	91		
Question 21			
Answer	**Students**		
a	11		
c	1		
d	79	87%	
Total	91		
Question 22			
Answer	**Students**		
a	19		
b	9		

c	54	59%	
d	7		
Without answer	2		
Total	91		
Question 23			
Answer	**Students**		
a	23	25%	
b	1		
c	52		
d	13		
bd	1		
Without answer	1		
Total	91		
Question 24			
Answer	**Students**		
a	3		
b	53	58%	
c	5		
d	29		
Without answer	1		
Total	91		
Question 25			
Answer	**Students**		Legend:
a	1		3 right answers
ab	1		2 right answers
abcd	1	1%	1 right answer
abd	2	2%	

ad	3		
b	12	13%	
bc	2	2%	
bcd	30	33%	
bd	12	13%	
c	3		
cd	8	9%	
d	10	11%	
Without answer	6		
Total	91		
Question 26			
Answer	**Students**		
a	3		
b	17		
c	53	58%	
d	15		
e	3		
Total	91		
Question 27			
Answer	**Students**		
f	2		
x	89	98%	
Total	91		
Question 28			
Answer	**Students**		
a	76	84%	
c	1		
d	1		

g	9		
o	1	1%	
s	2		
t	1		
Total	91		
Question 29			
Answer	**Students**		
a	11	12%	
c	1		
g	69		
o	7	8%	
s	1		
y	1		
Without answer	1		
Total	91		
Question 30			
Answer	**Students**		
j	71	78%	
m	2		
v	17		
Without answer	1		
Total	91		
Question 31			
Answer	**Students**		
j	17		
m	3		
r	1		
v	70	77%	

Total	91		
Question 32			
Answer	Students		
a	1		
c	11		
f	1		
g	2		
h	59	65%	
i	13	14%	
l	1		
o	2		
s	1		
Total	91		
Question 33			
Answer	**Students**		
a	1		
b	1		
c	7		
g	2		
h	11	12%	
i	56	62%	
n	3		
s	9		
y	1		
Total	91		
Question 34			
Answer	**Students**		
b	1		
l	1		

m	81	89%	
n	3		
v	3		
x	1		
y	1		
Total	91		
Question 35			
Answer	**Students**		
b	1		
c	44	48%	
g	3		
h	15		
l	1		
m	1		
n	1		
o	13	14%	
s	10	11%	
y	1		
Without answer	1		
Total	91		
Question 36			
Answer	**Students**		
c	12	13%	
g	1		
h	5		
i	16		
n	2		
o	26	29%	
s	28	31%	
Without answer	1		

Total	91		
Question 37			
Answer	**Students**		
a	2		
b	1		
c	11	12%	
g	2		
h	9		
i	4		
k	1		
n	1		
o	21	23%	
s	35	38%	
y	1		
Without answer	3		
Total	91		
Question 38			
Answer	**Students**		
d	69	76%	
e	4		
f	3		
k	2		
l	3	3%	
n	2		
r	2		
t	1		
u	1		
w	4		
Total	91		

Question 39			
Answer	**Students**		
d	1	1%	
e	4		
f	5		
i	2		
l	64	70%	
p	3		
r	2		
u	4		
v	2		
w	3		
x	1		
Total	91		
Question 40			
Answer	**Students**		
f	9		
j	1		
n	2		
w	63	69%	
y	16		
Total	91		
Question 41			
Answer	**Students**		
a	6		
b	10		
c	19		
d	14		
e	42	46%	
Total	91		

Question 42			
Answer	**Students**		
a	15		
b	23		
c	13		
d	40	44%	
Total	91		
Question 43			
Answer	**Students**		
a	1		
b	7		
c	63	69%	
ce	2		
d	3		
defg	1		
e	4		
f	5		
g	2		
Without answer	3		
Total	91		
Question 44			
Answer	**Students**		
a	10		
b	69	76%	
c	4		
d	7		
Without answer	1		
Total	91		

Question 45			Legend:
Answer	**Students**		2 right answers
a	53	58%	1 right answer
ab	3	3%	
b	10		
c	8		
d	17	19%	
Total	91		
Question 46			
Answer	**Students**		Legend:
ab	1	1%	8 right answers
abcde	3	3%	7 right answers
abcdefg	1	1%	6 right answers
abcdegi	1	1%	5 right answers
abcghi	1	1%	4 right answers
abde	20	22%	3 right answers
abdef	1	1%	2 right answers
abdefg	3	3%	
abdefgij	1	1%	
abdefgj	5	5%	
abdefhj	4	4%	
abdefj	1	1%	
abdeg	9	10%	
abdegh	1	1%	
abdegij	4	4%	
abdegj	14	15%	
abdehi	1	1%	

abdeij	1	1%	
abdej	9	10%	
abdgij	2	2%	
abdj	1	1%	
ac	1		
adefhj	1	1%	
bcde	1	1%	
bde	1	1%	
bdegh	1	1%	
bdej	1	1%	
Without answer	1		
Total	91		
Question 47			
Answer	**Students**		
a	11		
b	54	59%	
c	15		
d	10		
Without answer	1		
Total	91		
Question 48			Legend:
Answer	**Students**		5 right answers
a	1		4 right answers
abcdfgh	1	1%	3 right answers
abcdg	1	1%	2 right answers
abefh	1		1 right answer
acdfgh	4	4%	
acdfh	2	2%	

acefgh	1	1%	
acf	1	1%	
adfh	1	1%	
bcd	1	1%	
bcdf	1	1%	
bcdfgh	8	9%	
bcdfh	1	1%	
bcdfi	1	1%	
bcdh	2	2%	
bcefgh	1	1%	
bcefhi	1		
bceh	1		
bcfh	5	5%	
bdfgh	2	2%	
bdfh	2	2%	
bdfhi	1	1%	
befgh	1	1%	
beh	1		
bfh	2	2%	
bfhi	1		
bgh	1	1%	
cdfgh	15	16%	
cdfh	8	9%	
cdgh	2	2%	
cdh	2	2%	
cdj	1	1%	
cefh	3	3%	
cf	1	1%	
cfgh	4	4%	
cfh	4	4%	
dfh	2	2%	
h	1	1%	
Without answer	2		
Total	91		

Question 49			
Answer	**Students**		
a	6		
b	10		
c	69	76%	
d	6		
Total	91		
Question 50			Legend:
Answer	**Students**		3 right answers
a	2		2 right answers
ab	1		1 right answer
abce	1	1%	
abcf	2		
abde	2		
ace	1	1%	
acf	2		
ad	1		
ade	3		
adf	3		
b	10	11%	
bc	21	23%	
bce	18	20%	
bcf	7	8%	
bde	1	1%	
bdf	6		
be	4	4%	
bf	1		
c	1	1%	
Without answer	4		
Total	91		

Question 51			
Answer	**Students**		
a	2		
b	79	87%	
c	8	9%	
e	1		
g	1		
Total	91		
Question 52			
Answer	**Students**		
a	1		
d	1		
e	22	24%	
f	33	36%	
g	34		
Total	91		
Question 53			
Answer	**Students**		
a	64	70%	
b	1		
d	2		
e	5		
j	16		
k	1		
l	1		
m	1		
Total	91		

Question 54			
Answer	**Students**		
c	2		
g	85	93%	
k	3		
Without answer	1		
Total	91		
Question 55			
Answer	**Students**		
b	1		
c	80	88%	
e	1		
j	4		
k	1		
l	2		
m	1		
Without answer	1		
Total	91		
Question 56			
Answer	**Students**		
a	5		
b	12		
c	3		
d	3		
e	8		
f	1		
g	1		
i	2		
j	15		
l	37	41%	

m	1		
n	1		
p	1		
Without answer	1		
Total	91		
Question 57			Legend:
Answer	**Students**		2 right answers
a	2	2%	1 right answer
ace	3		
ad	7	8%	
adc	1	1%	
ade	12	13%	
adf	9	10%	
b	2		
bc	4		
bce	3		
bcf	11		
bde	1		
bdf	1		
bf	1		
c	1		
ce	2		
cf	2		
d	2	2%	
de	2		
df	1		
e	2		
f	2		
Without answer	20		
Total	91		

Question 58			
Answer	**Students**		
a	55	60%	
b	9		
c	14		
d	8		
Without answer	5		
Total	91		
Question 59			Legend:
Answer	**Students**		3 right answers
a	9	10%	2 right answers
ab	14	15%	1 right answer
abd	2	2%	
ac	8		
acd	8	9%	
ad	10	11%	
b	4	4%	
bc	1		
bd	7	8%	
c	2		
cd	8		
d	14	15%	
Without answer	4		
Total	91		
Question 60			
Answer	**Students**		
f	5		
g	84	92%	
h	1		

y	1		
Total	91		
Question 61			
Answer	Students		
c	1		
i	2		
j	84	92%	
m	1		
o	2		
Without answer	1		
Total	91		
Question 62			
Answer	**Students**		
c	2		
i	3		
k	1		
l	76	84%	
m	4		
n	2		
p	1		
Without answer	2		
Total	91		
Question 63			
Answer	**Students**		
c	1		
h	1		
i	2		
m	2		

n	77	85%	
o	1		
p	4		
r	1		
Without answer	2		
Total	91		
Question 64			
Answer	**Students**		
a	1		
e	3		
k	4		
m	3		
o	74	81%	
p	6		
Total	91		
Question 65			
Answer	**Students**		
a	1		
b	1		
c	7		
d	2		
n	1		
q	5		
r	72	79%	
Without answer	2		
Total	91		
Question 66			
Answer	**Students**		

f	1		
s	1		
t	1		
u	5		
v	82	90%	
Without answer	1		
Total	91		
Question 67			
Answer	**Students**		
c	1		
e	1		
f	1		
q	1		
s	8		
t	74	81%	
u	2		
v	2		
Without answer	1		
Total	91		

5.12 Practical Tests

Name: _____ **Country**: _____

Practical 01

Find the flow rate of the channel section.
For this activity, you would need to collaborate with the other student to measure the speed of the water flow.
One of you will enter the water in point 1, and go to the middle of the canal.
There, he/she will release a floating object.
The other student will go downstream at point 2 and, using a stopwatch, note the time taken for the floating object to move from point 1 to point 2.
Repeat this twice more and calculate the average value.

Calculate the speed of water (s) using the following parameters:

s = speed of water (meter/second)
d = distance covered (meters)
t = time (seconds)

Write the formula below: (5 points) s = Data collected: t_1 = , t_2 = , t_3 = Average time = (2 points) The speed of water according to your calculation =

Multiply this average value by 0.85, because the average speed of water is about 85 % of the surface speed.
The width of the canal is 6 m.
The average water depth value is 1 m.

Assuming that the section is rectangular, calculate the theoretical area (A). (2 points)

A =

Using this result, calculate the flow across the section.
Write the formula below: (2 points)
Flow rate (m^3/s) =

Estimated (calculate) flow rate (m^3/s) assuming a rectangular cross section =
Question: The real flow rate is (a) (b) (c) the estimated (calculated) flow rate. (2 points)
Tick the correct answer above.

a. greater than
b. less than
c. the same as

Name: _____ **Country**: _____

Practical 02

Material: Psychrometer
Measure the air (dry and wet) temperatures in two places: under the sun and in the shadow. Try to choose places with the same land-use type.

a. temperature in sunny place dry: _____ wet:_____
b. temperature in shaded place dry: _____ wet:_____

Where should the relative humidity be higher? (5 points)

a. In the sunny place
b. In the shaded place
c. Similar in both places.

Using the given table, what is the relative humidity (percentage) in both sites?

a. relative humidity in the sunny place: _____ (%) (2 points)
b. relative humidity in the shaded place: _____ (%) (2 points)

Table to estimate relative humidity (%) using the wet bulb temperature (axis Y) and the difference between the dry and wet bulb temperatures (axis X).

Dry bulb temperature minus wet bulb temperature

건습계용 습도산출표(%)

Wet bulb temperature (ºC)	t′	건구온도(t)와 습구온도(t′)와의 차이(c)																			
		0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
↓ 습구온도 t′	40	100	97	94	91	88	85	83	80	78	75	73	71	68	66	64	62	60	58	57
	39	100	97	94	91	88	85	82	80	77	75	72	70	68	66	64	61	60	58	56
	38	100	97	94	91	88	85	82	79	77	74	72	70	67	65	63	61	59	57	56
	37	100	97	93	90	87	85	82	79	77	74	72	69	67	65	63	61	59	57	55
	36	100	97	93	90	87	84	82	79	76	74	71	69	67	64	62	60	58	56	54
	35	100	97	93	90	87	84	81	78	76	73	71	68	66	64	62	60	58	56	54
	34	100	97	93	90	87	84	81	78	75	73	70	68	66	63	61	59	57	55	53
	33	100	96	93	90	87	84	81	78	75	72	70	67	65	63	61	58	56	54	52
	32	100	96	93	90	86	83	80	77	75	72	69	67	65	62	60	58	56	54	52
	31	100	96	93	89	86	83	80	77	74	71	69	66	64	62	59	57	55	53	51
	30	100	96	93	89	86	83	80	77	74	71	68	66	63	61	59	56	54	52	50
	29	100	96	93	89	85	82	79	76	73	70	68	65	63	60	58	56	54	51	49
	28	100	96	92	89	85	82	79	76	73	70	67	65	62	60	57	55	53	51	48
	27	100	96	92	89	85	82	78	75	72	69	67	64	61	59	56	54	52	50	47
	26	100	96	92	88	85	81	78	74	71	68	66	63	60	58	55	53	51	49	46
	25	100	96	92	88	84	81	77	74	71	67	65	62	59	57	54	52	50	47	45
	24	100	96	92	88	84	80	77	74	70	67	64	61	59	55	53	51	49	47	44
	23	100	96	91	87	84	80	76	73	69	67	63	61	58	55	53	50	48	46	43
	22	100	96	91	87	83	80	76	72	69	66	63	60	57	55	52	49	47	45	42
	21	100	96	91	87	83	79	75	72	68	65	62	59	56	54	51	49	46	43	41
Wet bulb temperature (ºC)	20	100	95	91	87	85	78	74	71	67	64	61	58	55	53	49	47	44	43	40
	19	100	95	91	86	82	78	74	70	66	63	60	57	54	51	48	46	43	41	39
	18	100	95	90	86	81	77	74	70	66	63	59	56	53	50	47	45	42	40	37
	17	100	95	90	85	81	77	72	69	65	62	58	55	52	49	46	43	40	39	36
	16	100	95	90	85	80	76	72	68	64	60	57	54	50	48	44	42	39	36	34
↓ 습구온도 t′	15	100	95	89	84	80	75	71	67	63	59	55	52	49	46	43	41	38	35	33
	14	100	94	89	84	79	74	70	66	62	58	54	51	47	45	41	39	36	34	31
	13	100	94	89	84	78	74	69	65	61	57	53	50	46	43	40	37	34	32	29
	12	100	94	89	83	78	73	68	63	59	56	52	48	44	42	38	35	32	30	27
	11	100	94	89	83	77	72	67	62	58	54	50	47	43	40	36	33	30	28	25
	10	100	94	87	82	76	71	66	61	57	53	49	45	41	38	34	31	28	26	23
	09	100	94	87	81	75	70	65	60	55	51	47	43	39	36	32	29	26	23	20
	08	100	93	87	80	74	69	63	58	54	49	45	41	37	34	30	27	24	21	18
	07	100	93	86	79	73	67	62	57	52	47	43	39	35	31	28	25	21	18	15
	06	100	93	85	79	72	66	61	55	50	45	41	36	33	28	25	22	18	16	13
	05	100	93	85	78	71	65	59	54	48	43	39	34	30	26	22	18	16	12	10
	04	100	92	84	77	70	64	57	52	47	41	36	32	28	23	19	15	13		
	03	100	92	83	76	69	62	55	49	44	38	33	29	24	20	16				
	02	100	91	82	74	67	60	53	47	41	35	30	25	21	17					
	01	100	91	82	73	65	58	51	45	38	33	27	22	17						

Name: _____ **Country**: _____

Practical 03

Plate Tectonics Theory: The Dance of the Continents

Instruction:
Please return the maps and the answer sheet.

You are provided with a set of five paleogeographic maps of Australia and a map.
You are going to establish the path of movement of Australia during a certain geological period by drawing its position on the map (provided to you) at different times. For this, you will:

- Draw, for each age, the position of Australia on the map provided using the outline of Australia. Assume, for simplicity, that the longitude of the centre of Australia is the same all through the geological period. (5 points)
- Write the age for each position.
- Draw arrows to indicate the path of movement of Australia. (4 points)

Choose the sentence which best describes the movement of Australia during the whole period. (Correct answer = 1 point)

a. Australia did not move during the geological period.
b. Australia moved southward, then northward during the geological period without rotating.
c. Australia moved northward, then southward during the geological period without rotating.
d. Australia moved northward, then southward during the geological period and rotated mostly clockwise.
e. Australia moved northward, then southward during the geological period and rotated mostly counter-clockwise.
f. Australia moved southward, then northward during the geological period and rotated mostly clock-wise.
g. Australia moved southward, then northward during the geological period and rotated mostly counter-clockwise.

For the three periods indicated in the table below, what could have been the climate in the center of Australia? (1 point x 3 = 3 points)

Early Cretaceous (120 Ma)	(a) Temperate (b) Polar (c) Arid (d) Semi-arid (e) Equatorial

Late Devonian (365 Ma)	(a) Temperate (b) Polar (c) Arid (d) Semi-arid (e) Equatorial
Early-Mid Devonian (400 to 380 Ma)	(a) Temperate (b) Polar (c) Arid (d) Semi-arid (e) Equatorial

Name: _____ **Country**: _____

Practical 04
Geo Field evaluation

Field kit: hammer, hydrochloric acid, knife

Note: THE ROCKS AT STOPS 1 AND 2 MAY CONTAIN ONE OR MORE MINERALS.

Stop 1
1. Using the kit, identify the rock here (Circle the correct answer from the options given below). (5 points)

a. Limestone
b. Marl
c. Mica schist
d. Porphyritic rock
e. Obsidian
f. Sandstone
g. Schist
h. Rhyolite
i. Asphalt
j. Basalt
k. Chert
l. Shale
m. Dolomite
n. Gabbro
o. Gneiss
p. Granite
q. Quartzite

2. Based on its characteristics, what can you conclude about the rock? (5 points)

a. It is a sedimentary rock.
b. It is a plutonic rock.
c. It is a volcanic rock
d. It is a metamorphic rock.

Stop 2

3. Using the kit, identify the rock here. (Circle the correct answer from the options given below). (5 points)

a. Limestone
b. Marl
c. Mica schist
d. Porphyritic rock
e. Obsidian
f. Sandstone
g. Schist
h. Rhyolite
i. Asphalt
j. Gabbro
k. Gneiss
l. Granite
m. Quartzite
n. Shale
o. Dolomite
p. Chert
q. Basalt

4. Which mineral/s listed below is/are most likely the constituent/s of this rock at Stop 2? (5 points)

a. Calcite
b. Magnetite
c. Quartz
d. Clay
e. Garnet
f. Orthoclase
g. Olivine
h. Halite

5. What is the age relationship between the rock at Stop 1 and the rock at Stop 2? (10 points)

a. The rock at Stop 1 is younger.
b. The rock at Stop 1 is older.
c. Both rocks are of the same age.

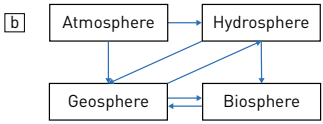
6. Which of the processes of the rock cycle listed below is demonstrated by the rocks at Stops 1 and 2? Mark ALL the possible processes. Note: Each correct answer = 1 point; Each wrong answer = -1 point

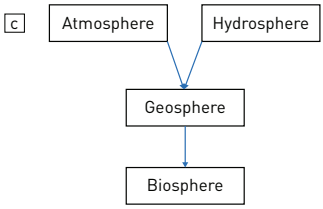
a. melting
b. slow cooling

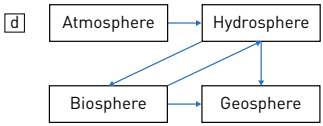
c. eruption
d. intrusion
e. fast cooling
f. slow cooling followed by fast cooling
g. uplift
h. erosion
i. transportation
j. sedimentation
k. lithification
l. burial
m. regional metamorphism
n. contact metamorphism

7. Chronologically arrange ONLY those processes that you marked above from the oldest to the youngest. Write the English letter corresponding to the process above the arrow. (Note: some process/es could appear twice.) (1 point for each correctly arranged process)

8. Answer the following question based on what you have explored here and what you have seen. Which of the schemes listed below best summarizes the interactions of the earth systems? (10 points)



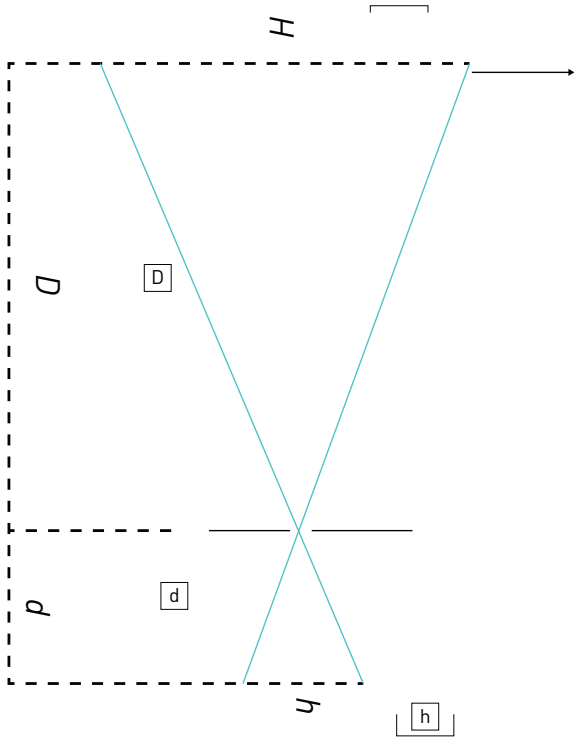




Name: _____ **Country**: _____

Practical 05

Astronomy
Measure the Earth rotation speed
In front of you there is a table with a hole. The sun light passes through the hole and hits a sheet of paper on the ground. After some time the sun light spot will move a certain distant "h".
"H" gives the apparent movement of the sun in the sky.
"d' stands for the table height.
"D" stands for distance between Earth and Sun, which is 1,5 x 10^{11} m. As you may notice the distance between Earth and Sun is much larger than the table height so you could approximate the situation to the following diagram)



On the given sheet are marked the two positions of the sun light spots with a 10 minute interval. Measure this distance "h". (1 point)
Calculate "H" from the given data (show the procedures). (2 points)
Calculate the apparent linear speed of the sun in km/s (show the procedures). (2 points)
Calculate, using your data, the angular speed of Earth rotation (degrees/min) (show the procedures). (2 points)

5.13 The International Team field Investigation (ITFI)

The mystery of The ball stone

Research question 1:
How can you explain the position of the rocks here?

Remark:
Try to suggest as many possibilities as you can and analyze the strengths and weaknesses of each possibility.

Research question 2:
What are the interrelationships between this phenomenon and (all) the earth systems?

Equipment:
Open mind

Time table:
You have one hour to collect the data and for the rest of time you have to manage your time for data analysis, making conclusions and design presentation.

The soil of Pocos de Caldas

Research question:
What are the interrelationships between the soil of Pocos de Caldas and the (all) earth systems?

Remark:
You have to compare two soil profiles.

Time table:
You have one hour to collect the data and for the rest of time you have to manage your time for data analysis, making conclusions and design presentation.

The water of Pocos de Caldas

Research question:
What are the interrelationships between the thermal water of Pocos de Caldas and the (all) earth systems?

Remark:
Compare the thermal water with surface water in terms of their chemical and physical properties.

Equipment:
Multimeter with sensors to analyze temperature, conductivity, pH, tds, Oxygen, Nitrogen.

The following is a table with all the physical and chemical parameters that you have to measure. If you don't understand the meaning of each of the parameters below, please ask your guide (before measuring) for a preliminary understanding and later search the Google for more in-depth understanding.

Parameters	Surface water	Thermal water
Temp.		
pH		
EC		
tds		
OD		
ORD		
%O		
NTU		

Rubric for evaluation of the ITFI project presentation

The content

components	Complete				Partial				Very limited	
The depth of the project:	10	9	8	7	6	5	4	3	2	1
	How much knowledge and information was provided beyond what was provided by the field guide.									
Using of geological principals	10	9	8	7	6	5	4	3	2	1
Complete connection of the earth systems	10	9	8	7	6	5	4	3	2	1
Originality and creativity						5	4	3	2	1
	Presenting of original ideas and perspectives which were not presented by the field leader.									

The structure of the presentation

Tasks	Complete				Partial				Very limited	
The subject and purpose are clear	10	9	8	7	6	5	4	3	2	1
A clear connection among presentations' parts (Fluency)	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

The use of the tool

Tasks	Complete				Partial				Very limited	
Concretization level of the subjects	10	9	8	7	6	5	4	3	2	1
Minimal texts and clear fonts.	10	9	8	7	6	5	4	3	2	1
Dynamic that serves the content	10	9	8	7	6	5	4	3	2	1
Aesthetic	10	9	8	7	6	5	4	3	2	1

The oral presentation

Tasks	Complete				Partial				Very limited	
Synchronization between the oral and the PPt	10	9	8	7	6	5	4	3	2	1
Fluent speaking	10	9	8	7	6	5	4	3	2	1

Criteria (co-operation and involvement)	Complete				Partial				Very limited	
How many team members were actually involved in the investigation?	10	9	8	7	6	5	4	3	2	1
Quality of discussion amongst members	10	9	8	7	6	5	4	3	2	1
Were they open to learning from each other?	10	9	8	7	6	5	4	3	2	1
Whether the members respected others and give them opportunity to contribute and speak up?	10	9	8	7	6	5	4	3	2	1

ITFI Groups

Group	Country:	Full Name:
AI	Australia	Jade Hoang Pham
AI	Brazil	Daiany Gomes Mesquita de Miranda
AI	India	Nachiket Girish
AI	Italy	Alessandro Rosa
AI	Kazakhstan	Yernur Permebek
AI	Pakistan	Zain Ahmed Malik
AI	Spain	Álvaro Álvarez Tomás
AI	Thailand	Kunanon Leelahakorn
BI	Australia	Sacha Brigitte Mann
BI	Brazil	Maria Fernanda de Souza Ganja
BI	India	Neel Karia
BI	Italy	Marco Lucio Mangiacapre
BI	Korea (Republic Of)	Byung Hyun Kim
BI	Portugal	Carolina Ponte de Oliveira Esteves
BI	Spain	Helena Ubach Raya
BI	Thailand	Mr. Patsakorn Tangadulrat
CI	Australia	Timothy David Hume
CI	France	Adrien Fradet
CI	India	Tarun Yadav
CI	Italy	Marco Malandrone
CI	Korea (Republic Of)	Seung Beom Ahn
CI	Portugal	José Pedro Moreira de Carvalho
CI	Spain	Jonatan Romero Matos
CI	Thailand	Panthon Imemkamon
DI	Australia	Zoe Scarlatt Thompson
DI	France	Clément Astruc
DI	India	Dhruv Walia
DI	Italy	Maria Stella Cascone
DI	Korea (Republic Of)	Seung Won Jung
DI	Portugal	Vasco Joaquim de Sousa Esteves
DI	Spain	Marta Prieto Señarís
DI	Thailand	Pitchapon Jirawongsapan
EI	Austria	Anna Rupp
EI	France	Maxime Legoupil
EI	Indonesia	Abdel Hafiz
EI	Japan	Aritsune Tsuji
EI	Korea (Republic Of)	Seung Wuk Eun
EI	Romania	Alexandra Dima
EI	Sri Lanka	Ihala Gedara Ravini Nimaya Wimalasuriya

EI	Ukraine	Bukatiuk Roman
FI	Austria	Christoph Gruber-Veit
FI	France	Nicolas Papadopoulos
FI	Indonesia	Jason Hartanto
FI	Japan	Haruyuki Okinaka
FI	Norway	Johannes Karstein Midtbø
FI	Romania	Dan Mircea Neagoe
FI	Sri Lanka	Keragala Arachchilage Sachith Udara Keragala
FI	Ukraine	Kykyna Anhelina
GI	Austria	Jasmin Pfeifer
GI	Germany	Clara Von Hirschhausen
GI	Indonesia	Nanda Adi Kurniawan
GI	Japan	Kiyoaki Doi
GI	Norway	Lise Stornes Eiane
GI	Romania	Maria Velicu
GI	Sri Lanka	Liyanage Tharindu Nirmal Wickremasinghe
GI	Ukraine	Lushchyk Bohdan
HI	Austria	Selina Löschenkohl
HI	Germany	Leander Adrian Schnee
HI	Indonesia	Ryan Setyabudi
HI	Japan	Takanobu Mogi
HI	Norway	Ole Wanvik Haugen
HI	Romania	Tudor Cristian Cozma
HI	Sri Lanka	Poruthotage Varuni Michelle Fernando
HI	Ukraine	Yevdokymova Oleksandra
II	Brazil	Antônio Vítor Dehet-Many
II	Germany	Lennart Krügel
II	Israel	Garfunkel Ayelet
II	Japan	Yuma Kakutani
II	Norway	Sigurds Vågslid
II	Pakistan	Omair Rashid
II	Russia	Alexandra Borisenko
II	Taiwan	An-Jun, Liu
JI	Brazil	Cláudio de Brito da Silva
JI	Germany	Lukas Hahne
JI	Israel	Itay Gat
JI	Kazakhstan	Anelya Tynysbek
JI	Pakistan	Hamza Haider
JI	Russia	Daria Diagileva
JI	Taiwan	Hsing-Hung, Chou
JI	Usa	Ariel Kelly Leong
KI	Brazil	Geferson Rocha Santos

KI	Germany	Leonard Schmitt
KI	Israel	Lior Fein
KI	Kazakhstan	Aruzhan Nurulla
KI	Pakistan	Muhammad Ahmad Faruqui
KI	Russia	Mikhail Valinkin
KI	Taiwan	Kai-Hung, Cheng
KI	Usa	Rylee Roseann Wrenner
LI	Brazil	Shéron Luma de Oliveira
LI	India	Kushagra Jain
LI	Israel	Yuval Katz
LI	Kazakhstan	Kalamkas Zhagyparova
LI	Russia	Valentin Kovalev
LI	Taiwan	Yao-Ting, Hsu
LI	Usa	Catherine Kidder Michael

Ranking

Total score	Sum of the averages
Team E	154,62
Team J	154,08
Team B	152,82
Team D	145,92
Team F	143,60
Team I	139,65
Team A	136,37
Team G	135,93
Team H	135,60
Team C	133,92
Team L	129,23
Team K	128,63

Components	Team A						Team B						Team C						Team D						Team E						Team F					
Contend	Av. 1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	**Av.4**	**Av.5**	**Average**	**Av.1**	**Av.2**	**Av.3**	**Av.4**	**Av.5**	**Average**	**Av.1**	**Av.2**	**Av.3**	**Av.4**	**Av.5**	**Average**
1	7	9	7	9	6	7,6	10	9	8	10	10	9,4	8	7	6	9	9	7,8	7	9	7	9	10	8,4	10	9	8	-	9	9	9	8	7	7	-	7,75
2	6	8	8	8	7	7,4	9	9	8	10	10	9,2	6	7	9	8	8	7,6	5	-	8	9	9	7,75	10	10	6	10	9	9	8	9	8	6	8	7,8
3	6	7	7	8	6	6,8	10	9	8	10	10	9,4	8	6	6	8	9	7,4	8	8	8	8	10	8,4	9	9	5	10	8	8,2	9	8	7	9	9	8,4
4	4	5	-	5	-	4,66667	5	4	-	5	-	4,66667	-	-	3	4	4	3,66667	-	-	3	4	4	3,66667	5	4	-	5	-	4,66667	4	4	-	-	5	4,33333
Structure																																				
1	8	8	6	8	7	7,4	9	8	8	9	10	8,8	9	6	7	8	7	7,4	7	9	10	9	9	8,8	10	9	10	10	9	9,6	8	8	8	7	8	7,8
2	18	16	12	16	16	15,6	19	18	13	18	18	17,2	17	17	17	15	14	16	16	17	14	18	18	16,6	19	18	16	18	18	17,8	18	17	18	12	17	16,4
The use of tool																																				
1	8	8	6	8	6	7,2	9	8	7	10	9	8,6	8	5	6	8	8	7	7	8	7	9	9	8	10	8	8	-	9	8,75	8	7	6	6	7	6,8
2	9	9	6	10	6	8	9	10	7	9	9	8,8	8	3	8	8	8	7	8	7	7	9	9	8	10	9	9	10	9	9,4	9	8	7	7	10	8,2
3	8	9	7	9	7	8	9	8	7	9	9	8,4	8	5	5	7	8	6,6	8	8	6	9	8	7,8	9	8	9	9	9	8,8	8	8	7	7	9	7,8
4	7	9	7	8	6	7,4	9	9	8	10	10	9,2	8	7	6	8	9	7,6	8	9	7	9	9	8,4	10	9	10	-	8	9,25	8	8	5	7	10	7,6
Oral Presentation																																				
1	8	8	7	9	6	7,6	9	8	6	10	9	8,4	8	6	7	7	9	7,4	8	9	6	9	9	8,2	9	9	8	10	8	8,8	8	7	8	7	9	7,8
2	8	8	6	9	7	7,6	9	7	6	9	8	7,8	9	5	7	7	8	7,2	9	9	8	9	9	8,8	9	9	8	9	8	8,6	8	8	7	7	9	7,8
3	7	9	10	10	7	8,6	8	8	7	8	5	7,2	9	7	10	-	8	8,5	9	8	10	9	9	9	9	8	6	7	5	7	10	10	8	8	10	9,2
International Cooperation																																				
1	8	10	-	7	-	8,33333	9	10	-	8	-	9	9	-	7	7	9	8	9	-	7	9	9	8,5	10	8	-	-	-	9	10	8	-	-	8	8,66667
2	8	8	-	8	-	8	9	9	-	10	-	9,33333	9	-	7	7	9	8	9	-	7	9	9	8,5	8	9	-	10	-	9	9	9	-	-	9	9
3	8	8	-	7	-	7,66667	9	9	-	8	-	8,66667	9	-	7	8	9	8,25	9	-	7	9	9	8,5	8	9	-	10	-	9	9	9	-	-	9	9
4	9	10	8	7	-	8,5	9	9	8	9	-	8,75	9	-	7	9	9	8,5	9	8	7	9	10	8,6	8	10	9	8	-	8,75	9	10	-	8	10	9,25
						136,367						152,817						133,917						145,917						154,617						143,6

Components	Team G						Team H						Team I						Team J						Team K						Team L					
Contend	**Av.1**	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	**Av.4**	**Av.5**	**Average**	**Av.1**	**Av.2**	**Av.3**	**Av.4**	**Av.5**	**Average**	**Av.1**	**Av.2**	**Av.3**	**Av.4**	**Av.5**	**Average**
1	9	8	8	9	8	8,4	7	8	6	7	9	7,4	8	8	5	7	9	7,4	8	9	7	9	9	8,4	8	8	6	8	7	7,4	7	7	7	6	9	7,2
2	9	7	8	9	8	8,2	7	7	7	7	8	7,2	7	7	5	7	9	7	8	9	7	8	10	8,4	2	7	7	8	7	6,2	2	7	8	6	8	6,2
3	9	7	6	-	8	7,5	7	9	5	8	8	7,4	8	8	7	8	9	8	8	9	8	9	10	8,8	7	8	6	6	7	6,8	7	8	8	5	8	7,2
4	-	-	3	3	4	3,33333	5	-	4	4	5	4,5	4	3	5	-	5	4,25	-	4	-	-	5	4,5	-	-	3	4	3	3,33333	-	-	3	3	4	3,33333
Structure																																				
1	9	6	6	8	7	7,2	7	8	6	8	8	7,4	9	7	6	7	-	7,25	8	9	7	9	9	8,4	7	8	8	8	7	7,6	9	7	9	6	10	8,2
2	18	13	13	15	13	14,4	12	18	13	16	14	14,6	10	17	12	17	17	14,6	17	19	14	18	18	17,2	15	12	17	16	12	14,4	17	15	16	10	18	15,2
The use of tool																																				
1	8	6	8	8	8	7,6	6	7	6	9	8	7,2	8	7	6	7	9	7,4	8	9	6	9	9	8,2	6	7	7	-	7	6,75	4	6	8	6	8	6,4
2	9	6	8	8	9	8	7	7	10	8	9	8,2	9	8	7	7	10	8,2	9	9	8	10	9	9	3	7	7	8	7	6,4	3	6	6	5	9	5,8
3	9	8	6	8	8	7,8	6	8	5	8	7	6,8	9	8	7	6	9	7,8	9	9	8	10	-	9	7	7	7	7	7	7	7	7	7	5	9	7
4	9	6	7	9	8	7,8	5	8	5	10	10	7,6	8	7	6	7	9	7,4	8	8	8	-	9	8,25	7	6	7	7	7	6,8	7	7	6	6	9	7
Oral Presentation																																				
1	9	6	6	9	8	7,6	7	8	6	8	9	7,6	8	9	8	7	10	8,4	8	9	8	10	9	8,8	9	8	7	7	7	7,6	9	6	7	7	9	7,6
2	9	6	8	8	8	7,8	6	9	6	8	8	7,4	8	8	8	7	7	7,6	8	9	8	8	9	8,4	9	8	7	7	7	7,6	9	8	8	7	8	8
3	9	3	7	8	7	6,8	10	7	10	8	9	8,8	8	9	8	8	10	8,6	9	9	10	9	10	9,4	9	9	10	8	9	9	9	9	10	6	9	8,6
International Cooperation																																				
1	9	-	7	9	9	8,5	-	9	7	9	10	8,75	10	8	-	-	9	9	10	9	10	-	9	9,5	10	-	7	8	9	8,5	10	-	7	7	9	8,25
2	9	-	7	8	9	8,25	-	8	7	8	9	8	9	9	-	-	9	9	9	9	-	-	10	9,33333	7	-	7	8	9	7,75	7	-	7	8	9	7,75
3	9	-	7	8	9	8,25	-	8	7	8	9	8	9	9	-	-	9	9	9	9	-	-	9	9	7	-	7	8	9	7,75	7	-	7	7	9	7,5
4	9	-	7	9	9	8,5	-	9	7	9	10	8,75	9	8	8	-	10	8,75	9	10	10	-	9	9,5	7	-	7	8	9	7,75	7	-	7	8	10	8
						135,933						135,6						139,65						154,083						128,633						129,233

5.14 Earth System Project (ESP)

ESP Groups

Esp Groups		
Groups	Country:	Full Name:
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AE	Germany	Clara Von Hirschhausen
AE	Israel	Garfunkel Ayelet
AE	Japan	Takanobu Mogi
AE	Romania	Dan Mircea Neagoe
AE	Taiwan	Yao-Ting, Hsu
AE	Ukraine	Lushchyk Bohdan
BE	Austria	Christoph Gruber-Veit
BE	Brazil	Antônio Vítor Dehet-Many
BE	India	Kushagra Jain
BE	Israel	Itay Gat
BE	Italy	Marco Malandrone
BE	Kazakhstan	Aruzhan Nurulla
BE	Portugal	Carolina Ponte de Oliveira Esteves
BE	Sri Lanka	Liyanage Tharindu Nirmal Wickremasinghe
CE	Italy	Alessandro Rosa
CE	Australia	Sacha Brigitte Mann
CE	Germany	Leander Adrian Schnee
CE	Korea (Republic Of)	Seung Beom Ahn
CE	Norway	Sigurds Vågslid
CE	Russia	Daria Diagileva
CE	Thailand	Kunanon Leelahakorn
CE	Usa	Rylee Roseann Wrenner
DE	Australia	Timothy David Hume
DE	Austria	Jasmin Pfeifer
DE	Germany	Lennart Krügel
DE	Russia	Mikhail Valinkin
DE	Sri Lanka	Ihala Gedara Ravini Nimaya Wimalasuriya
DE	Thailand	Pitchapon Jirawongsapan
DE	Ukraine	Yevdokymova Oleksandra
DE	Usa	Catherine Kidder Michael
EE	Australia	Zoe Scarlatt Thompson
EE	Indonesia	Jason Hartanto
EE	Kazakhstan	Kalamkas Zhagyparova
EE	Korea (Republic Of)	Byung Hyun Kim
EE	Norway	Lise Stornes Eiane

EE	Portugal	José Pedro Moreira de Carvalho
EE	Taiwan	An-Jun, Liu
EE	Usa	Ariel Kelly Leong
FE	Austria	Selina Löschenkohl
FE	Brazil	Cláudio De Brito Da Silva
FE	France	Clément Astruc
FE	Germany	Leonard Schmitt
FE	Japan	Aritsune Tsuji
FE	Romania	Maria Velicu
FE	Spain	Álvaro Álvarez Tomás
FE	Thailand	Mr. Patsakorn Tangadulrat
GE	Brazil	Geferson Rocha Santos
GE	France	Maxime Legoupil
GE	India	Nachiket Girish
GE	Israel	Yuval Katz
GE	Italy	Marco Lucio Mangiacapre
GE	Korea (Republic Of)	Seung Won Jung
GE	Pakistan	Hamza Haider
GE	Ukraine	Kykyna Anhelina
HE	Brazil	Shéron Luma de Oliveira
HE	France	Nicolas Papadopoulos
HE	Indonesia	Nanda Adi Kurniawan
HE	Pakistan	Muhammad Ahmad Faruqui
HE	Portugal	Vasco Joaquim de Sousa Esteves
HE	Russia	Alexandra Borisenko
HE	Spain	Helena Ubach Raya
HE	Ukraine	Bukatiuk Roman
IE	Brazil	Daiany Gomes Mesquita De Miranda
IE	France	Adrien Fradet
IE	India	Neel Karia
IE	Indonesia	Ryan Setyabudi
IE	Israel	Lior Fein
IE	Russia	Valentin Kovalev
IE	Spain	Marta Prieto Señarís
IE	Sri Lanka	Poruthotage Varuni Michelle Fernando
JE	Brazil	Maria Fernanda de Souza Ganja
JE	India	Tarun Yadav
JE	Italy	Maria Stella Cascone
JE	Japan	Yuma Kakutani
JE	Korea (Republic Of)	Seung Wuk Eun
JE	Pakistan	Zain Ahmed Malik

JE	Romania	Tudor Cristian Cozma
JE	Taiwan	Hsing-Hung, Chou
KE	Germany	Lukas Hahne
KE	India	Dhruv Walia
KE	Japan	Haruyuki Okinaka
KE	Kazakhstan	Yernur Permebek
KE	Norway	Ole Wanvik Haugen
KE	Romania	Alexandra Dima
KE	Spain	Jonatan Romero Matos
KE	Pakistan	Omair Rashid
LE	Indonesia	Abdel Hafiz
LE	Japan	Kiyoaki Doi
LE	Kazakhstan	Anelya Tynysbek
LE	Norway	Johannes Karstein Midtbø
LE	Taiwan	Kai-Hung, Cheng
LE	Sri Lanka	Keragala Arachchilage Sachith Udara Keragala
LE	Thailand	Panthon Imemkamon

Ranking

Total score	Sum of the averages
Team F	172,2
Team A	168,35
Team B	167,7
Team J	164,6
Team K	162,6
Team I	161,25
Team L	160,4
Team E	149,4
Team D	140,2
Team H	137,8
Team C	134,4
Team G	121,55

Compo-nents	Team A						Team B						Team C						Team D						Team E						Team F					
Contend	Av. 1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	**Av.4**	**Av.5**	**Average**	**Av.1**	**Av.2**	**Av.3**	**Av.4**	**Av.5**	**Average**	**Av.1**	**Av.2**	**Av.3**	**Av.4**	**Av.5**	**Ave-rage**
1	9	9	8	8	8	8,4	8	9	9	8	7	8,2	6	8	7	7	8	7,2	8	8	8	7	7	7,6	7	9	8	7	7	7,6	8	9	8	10	8	8,6
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Structure																																				
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Quality																																				
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Oral Pre-sentation																																				
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Inter-national Coopera-tion																																				
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						168,35						167,7						134,4						140,2						149,4						172,2

Components	**Team G**						**Team H**						**Team I**						**Team J**						**Team K**						**Team L**					
Contend	**Av.1**	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	Av.4	Av.5	Average	Av.1	Av.2	Av.3	**Av.4**	**Av.5**	**Average**	**Av.1**	**Av.2**	**Av.3**	**Av.4**	**Av.5**	**Average**	**Av.1**	**Av.2**	**Av.3**	**Av.4**	**Av.5**	**Average**
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Structure																																				
1	7	6	7	5	8	6,6	8	6	8	8	5	7	8	9	8	8	6	7,8	9	8	9	8	9	8,6	8	8	9	8	9	8,4	7	8	8	9	8	8
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Quality																																				
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Oral Presentation																																				

1 International Cooperation	13	7	13	6	14	10,6	15	12	13	17	17	14,8	14	14	17	17	15	15,4	18	15	17	15	15	16	17	16	17	17	17	16,8	19	17	16	17	14	16,6
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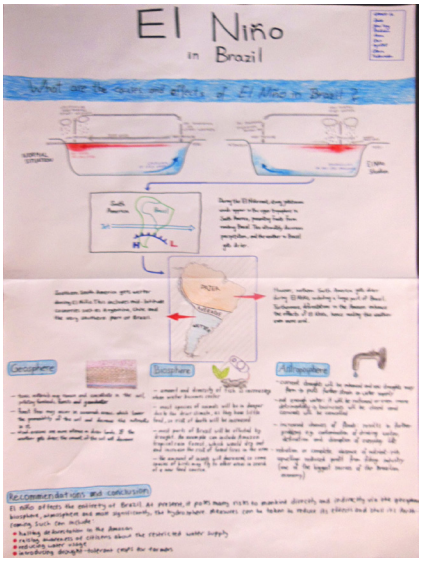
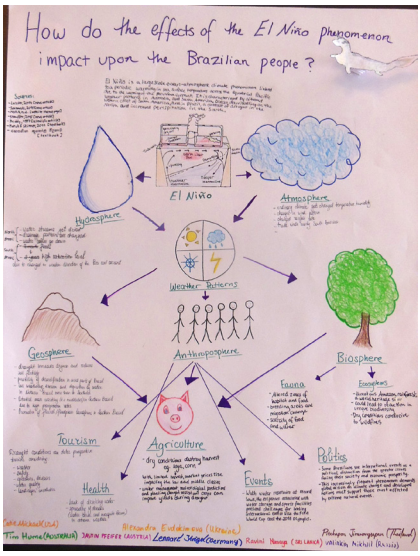
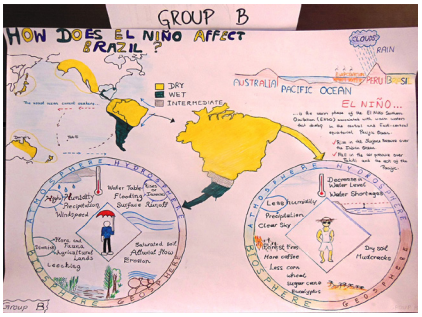
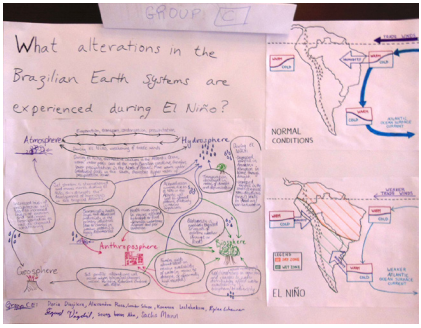
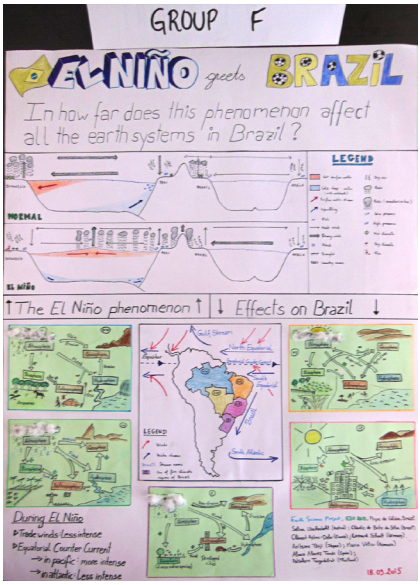
						121,55						137,8						161,25						164,6						162,6						160,4

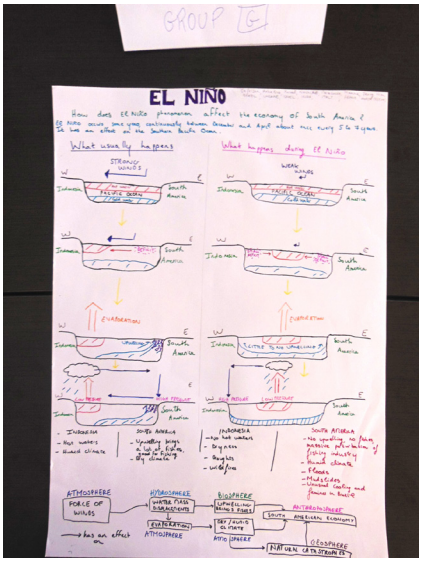

El Niño
in Brazil
What are the causes and effects of El Niño in Brazil?
Geosphere
Biosphere
Atmosphere
Recommendations and conclusion

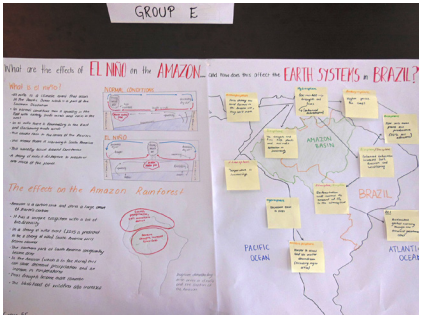

How do the effects of the El Niño phenomenon impact upon the Brazilian people?
El Niño
Hydrosphere
Atmosphere
Weather Patterns
Geosphere
Anthroposphere
Biosphere
Tourism
Agriculture
Health
Events
Politics
Fauna
Ecosystems

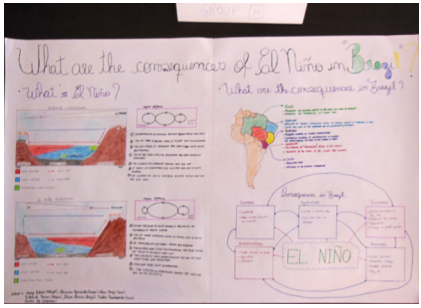

GROUP B
HOW DOES EL NIÑO Affect BRAZIL?
DRY
WET
INTERMEDIATE
AUSTRALIA
PACIFIC OCEAN
PERU
EL NIÑO...
Group B

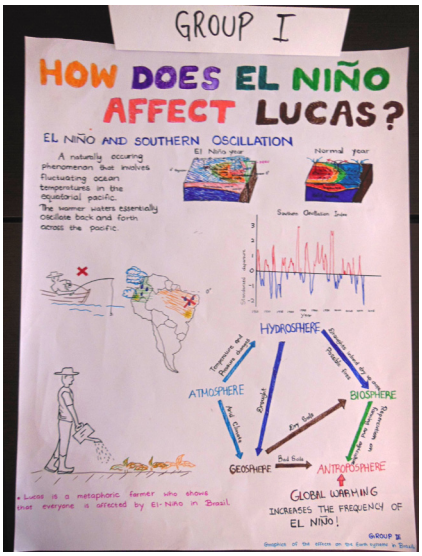

What alterations in the Brazilian Earth Systems are experienced during El Niño?
Atmosphere
Hydrosphere
Anthroposphere
Geosphere
Biosphere
NORMAL CONDITIONS
EL NIÑO

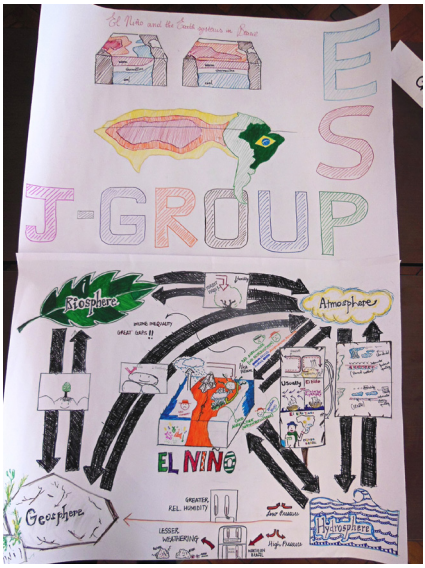

GROUP F
EL NIÑO greets BRAZIL
In how far does this phenomenon affect all the earth systems in Brazil?
LEGEND
NORMAL
EL NIÑO
↑ The El Niño phenomenon ↑
↓ Effects on Brazil ↓
During El Niño
Trade winds Less intense
Equatorial Counter Current
→ in pacific more intense
→ in atlantic Less intense

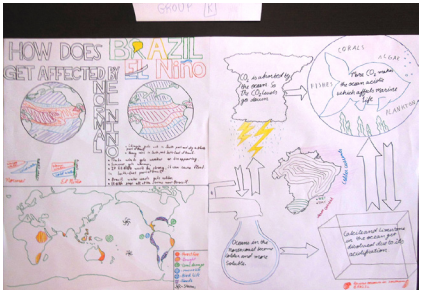

GROUP G
EL NIÑO
What usually happens
What happens during El Niño
ATMOSPHERE
HYDROSPHERE
BIOSPHERE
LITHOSPHERE

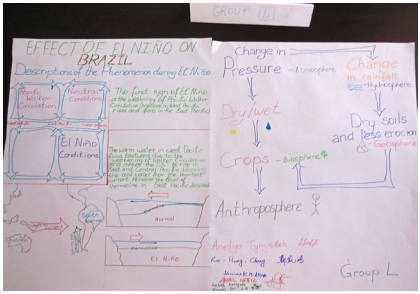

GROUP E
What are the effects of EL NIÑO on the AMAZON... and how does this affect the EARTH SYSTEMS in BRAZIL?
What is el niño?
The effects on the Amazon Rainforest
AMAZON BASIN
BRAZIL
PACIFIC OCEAN
ATLANTIC OCEAN


GROUP H
What are the consequences of El Niño on Brazil?
• What is El Niño?
• What are the consequences on Brazil?
EL NIÑO


GROUP I
HOW DOES EL NIÑO AFFECT LUCAS?
EL NIÑO AND SOUTHERN OSCILLATION
A naturally occuring phenomenon that involves fluctuating ocean temperatures in the equatorial pacific. The warmer waters essentially oscillate back and forth across the pacific.
El Niño year
Normal year
Southern Oscillation Index
HYDROSPHERE
ATMOSPHERE
BIOSPHERE
GEOSPHERE
ANTHROPOSPHERE
GLOBAL WARMING INCREASES THE FREQUENCY OF EL NIÑO!
Lucas is a metaphoric farmer who shows that everyone is affected by El Niño in Brazil.


El Niño and the Earth systems in Brazil
E S
J-GROUP
Atmosphere
EL NIÑO
Geosphere
Hydrosphere


HOW DOES BRAZIL GET AFFECTED IN EL NIÑO


EFFECT OF EL NIÑO ON BRAZIL
Descriptions of the Phenomenon during El Niño
El Niño Conditions
Change in Pressure
Dry/wet
Crops
Anthropsphere
Dry soils and less erosion
Group L

Appendix

Statutes of the Internal Earth Science Olympiad

(Version 3, Published: January 20, 2015)
Preamble:

The IESO statutes were revised based on resolutions passed by the International Jury which met in Santander, Spain on Sept. 25 and 27, 2014. This version (Version-3) was published on January 20, 2015 and it supersedes all previously dated or published versions.

1. Introduction

The International Earth Science Olympiad (IESO) is an annual earth science competition for secondary school students. The IESO has been founded as one of the major activities of the International Geoscience Education Organization (IGEO), and countries worldwide with a strong emphasis on earth science in their national curricula have supported the competition.

Students who are winners of the respective national competitions are invited to participate in the IESO, and all interested countries are encouraged to contribute to the IESO.

2. Aims of the IESO

The IESO is intended to:
- raise student interest in and public awareness of earth science,
- enhance earth science learning of school students,
- improve the teaching of earth science in schools,
- promote international cooperation in exchanging ideas and materials about earth science and, earth science education, and
- encourage friendly relationships among young learners from different countries, and promote talented and gifted students in earth science.

3. Organization

The IESO is organized by an authorized institution(s) of one of the participating countries with cooperation of the IESO Coordinating Committee and the Examination Board. The competition is held every year in the territory of the organizing country. The official language of the IESO is English.

4. Obligations of the Organizer

The organizer of the IESO is obliged to invite all countries that wish to take part in the competition. The organizer must provide all participating countries with an itinerary of the IESO and supply a report of the competition held. The organizer may invite outstanding scientists and educators as observers and/

or speakers by offering transportation and accident insurance for the invited person(s).

The organizer of the IESO agrees that there shall be no discrimination against countries and delegations on the basis of political orientation, diplomatic relationship, race, colour, gender, handicap, religious affiliation, or any other factors which are not pertinent to participation in the competition.

5. Delegations

Each participating country sends its own delegation. Each national delegation has a maximum of four participants and two mentors. In addition, a participating country may bring guest students and observers. Participants should not have been born before July 1, X-19, where X is the year of the Olympiad. The participants must not be university/college students. They can only be students of secondary/high school. If they have already graduated before the competition, the organizer must be informed about the date of their graduation. A student who has already participated in an IESO and who wants to participate in a subsequent IESO may do so only as a guest student and not as a member of a national team. This means that the student will not be eligible for any medals at the second or subsequent IESO.

The mentors should preferably be specialists in Earth science education or Earth scientists with some school teaching background. They should be able to discuss the questions/ tasks and how they can be improvised. They must know the official language of the IESO and thus be able to translate the question papers and related materials from English to the participants' native language. In addition, they should discuss the status of earth science education in their countries, what actions have been taken to promote earth science education, what could be achieved and what obstacles were faced.

6. Preparation of Items for IESO and Items of Co-operation

The organizer of the IESO is responsible for organizing all the logistics of IESO. The place and preliminary dates for the event should be presented by the organizer at least a year before the competition. The total duration of the IESO can range from one to two weeks. The event shall adopt the Earth System Science approach to impress upon the young minds that the Earth is but one large system. The event will consist of two parts: written (theory) and practical examinations. The written examination includes problems which are developed to measure the participants' robust knowledge and understanding in earth system science. The practical examination consists of tasks which are designed to assess participants' abilities to carry out scientific investigations in earth system science inquiries. The written examination is presented in a set of earth science problems which should be solved by participants within a period no longer than six hours. The practical examination includes experimental and/or field task(s) which should be completed by participants during a suitable period.

The Scientific Committee of the host country and Mentors and Observers of different countries may send their questions and ideas to the Co-ordinator

of the Examination Board. The Examination Board, while finalising the question papers, will ensure that the questions will be of good quality, of secondary/high school level, will test not the memory but the thinking ability and analytical skills of students, will conform to the Earth System Science approach, will correspond to the official IESO syllabus and will ensure a fair balance between written (theory) and practical tests. The Examination Board will also provide solutions and evaluation guidelines. Participants are given the theoretical problems and experimental or field tasks in a written format and supplied with materials needed to solve the problems and conduct the experiments. The participants are allowed to bring writing and drawing instruments and non-programmable calculators for the examinations.

International Team Field Investigation (ITFI) and Earth System Project (ESP) are two activities aimed at promoting international co-operation and forging bridges of friendship among young, talented students across the world. Annexures 1 and 2 provide more details of ITFI and ESP. The assignments for ITFI and ESP would also be designed under the supervision of the Examination Board, which has to ensure the quality of the assignments.

7. The International Jury

The International Jury for the competition consists of a chairperson and members. The chairperson of the International Jury is appointed by the organizer of the IESO. The members of the International Jury are the two mentors in the delegations from each participating country. Resolutions of the International Jury are passed on the basis of majority votes in the presence of at least 75% of the members. Each participating country is entitled to one vote. The chairperson has the casting vote in case of a tie.

The International Jury has the following responsibilities:

1) To ensure that the competition is conducted in accordance with the regulations,
2) To monitor the examination process. The International Jury has the right to make decisions on excluding participants from the examination in case they do not comply with the regulations, including cheating,
3) To supervise the procedure of marking the participants' answers and ensure that all participants are judged by the same evaluation criteria,
4) To approve the final results of the evaluation, confirm the rankings, and decide on prizes for the participants. The chairperson and members of the International Jury must keep the results and decisions concerning the evaluation and prizes confidential until an official announcement is made, and
5) To moderate any difference in final scores among International Juries (recommended).

8. Evaluation and Prizes

The participants' answers to the written and practical examinations are evaluated and marked by the International Jury. The rankings of the participants are based on the total scores of the written and practical examinations.

The official results of the evaluation and the number of medals to be awarded are decided finally by the International Jury. The number of gold medals is approximately 10% of the number of participants, 20% for silver medals, and 30% for bronze medals. An honourable mention may be made of a competitor(s) who does not win a medal but gains high marks for theoretical problems or one practical task. All medals and honourable mentions are awarded on an individual and/or team basis, not on the basis of national results. Each competitor receives a certificate in recognition of his/ her participation in the IESO.

Assignments for ITFI and ESP would also be evaluated by the International Jury. Members of the award-winning team/s in both ITFI and ESP would be given individual certificates. More details are given in Annexures 1 and 2.

9. Financing

Each country participating in the IESO must pay for its participation. The quantum of the registration fee is determined by the organizer of the IESO and requested in an official letter to be sent to the participating countries. The registration fee can be reduced for developing countries if the budget permits. The fee should be paid prior to or at the beginning of the IESO. Each participating country must pay the travel expenses (to and from) of its delegation to the place in the country where the IESO is held. All other expenses directly related to the IESO, including the cost of accommodation, meals, and local transportation for all delegations from countries, are covered by the organizer of the IESO. The organiser of IESO shall waive the registration fee of the Chair and Members of the Examination Board.

10. Bodies of the IESO

The Examination Board is charged with the responsibility of receiving ideas and questions from the local Scientific Committee, and Mentors and Observers of different countries for the IESO

examinations and finalising the question papers, besides providing the solutions and marking procedures as mentioned in paragraph 6 above. Besides, it also has to approve the ITFI and ESP assignments. The Advisory Board of the IESO advises the Coordinating Committee in maintaining high standards of the IESO. The Advisory Board is chaired by the chairperson of IGEO. The Advisory Board consists of International Council members of IGEO and representatives of related international organizations who are assigned by the chairperson as members of the Advisory Board. For the beginning period of the IESO, IESO Committee may function as the Advisory Board.

The Coordinating Committee attends to the long-term work involved in organizing the IESO. The members of the Coordinating Committee are the chairperson of IGEO and representatives of the countries which have hosted the IESO during the past two years and the countries which will host the IESO in the next two years. For the beginning period of the IESO, every participating country may have one member on the Coordinating Committee.

The Coordinating Committee elects its own chairperson and completes its

work in collaboration with the chairperson and the organizer of the IESO in accordance with the aims and regulations of the IESO. The Coordinating Committee may establish several commissions, such as Public Relations, Fund Raising, Syllabus Development, and Operative Matters, to manage urgent problems or tasks of the Olympiad. A commission is composed of several members. At least one of them should be a member of the Coordinating Committee, and others are collaborators invited by the Coordinating Committee.

The International Jury is an ad hoc body formed for each competition. The International Jury consists of the chairperson and up to two representatives each from all national delegations. It is chaired by a distinguished specialist in earth science and/or earth science education who is appointed by the organizing country of the IESO.

11. Statutes

All countries participating in the IESO, their delegations, and the bodies of the IESO are obliged to observe the IESO statutes. Proposals for changes in the statutes have to be submitted four weeks before the first day of the IESO in written form by email to the local organiser of the IESO, who in turn would distribute them via email to past and present IESO participants and the IESO country representatives, before the specified deadline. Changes in the statutes can only be made by the International Jury when more than two thirds of votes with regard to the total number of the members are in favour of the suggested changes. Any matter not included in the statues is decided upon in the meeting of the International Jury.

Annexure - 1

International Team Field Investigation (ITFI)

The International Earth Science Olympiad is not just about competition among students. One of the principal objectives of IESO is to promote international co-operation and forge bridges of friendship among young, talented students across the world. To achieve this objective, IESO has as its integral part the International Team Field Investigation (ITFI) and Earth System Project (ESP). These activities are unique to IESO and set the latter apart from all other international science olympiads. The spirit behind the activities is not competition but co-operation, and coming together and working together of students from different nationalities, diverse cultures and varied backgrounds. This is singularly important today, and much more so in future, because major strides in scientific research are no longer possible by the efforts of individual scientists but of groups of scientists from different disciplines, institutions and nations.

Each group will be assigned a site to investigate. Students carry out investigations, learn through observations, collect data and take pictures in the field, search the Internet for relevant information, analyse all the data critically and answer the questions posed for each site. Further, they will prepare a report and make a PowerPoint presentation before all the students, mentors and observers. Thus, the audience will get to share the excitement about all the ITFI

projects. A jury will evaluate the teams and decide on the recipients of GOLD/ SILVER/ BRONZE ITFI Teams. The rubric (evaluation scheme) for ITFI is given below:

Rubric for Evaluation of ITFI Project Presentation

Content

Components	Complete				Partial				Very limited	
The depth of the project	10	9	8	7	6	5	4	3	2	1
	Was knowledge and information content beyond that provided by the field guide?									
Use of geological principles	10	9	8	7	6	5	4	3	2	1
Complete connection of the earth systems	10	9	8	7	6	5	4	3	2	1
Originality and creativity						5	4	3	2	1
	Presenting original ideas and perspectives which were not presented by the field leader.									

Structure of the Presentation

Tasks	Complete							Partial								Very limited				
Clarity of subject and purpose	10		9		8		7		6		5		4		3		2		1	
A clear connection among presentations' parts (Flow of the presentation)	20	19	18	17	16	15	14	1	12	11	10	9	8	7	6	5	4	3	2	1

The use of Tools

Tasks	Complete				Partial				Very limited	
Concretization level of the subjects	10	9	8	7	6	5	4	3	2	1
Minimal text and clear fonts	10	9	8	7	6	5	4	3	2	1
Was the presentation dynamic to serve the content?	10	9	8	7	6	5	4	3	2	1
Contextual use of scientific terms	10	9	8	7	6	5	4	3	2	1
Aesthetics	10	9	8	7	6	5	4	3	2	1

Oral Presentation

Tasks	Complete				Partial				Very limited	
Synchronization between oral and PPT presentations	10	9	8	7	6	5	4	3	2	1
Fluency	10	9	8	7	6	5	4	3	2	1
Time management	10	9	8	7	6	5	4	3	2	1

International Co-operation (To be evaluated on site by a Volunteer in cognito)

Criteria (cooperation and involvement)	Complete				Partial				Very limited	
How many team members were actually involved in the investigation?	10	9	8	7	6	5	4	3	2	1
Quality of discussion amongst members	10	9	8	7	6	5	4	3	2	1
Were they open to learning from one another?	10	9	8	7	6	5	4	3	2	1
Did members respect others and give them an opportunity to contribute and speak up?	10	9	8	7	6	5	4	3	2	1

ANNEXURE – 2

EARTH SYSTEM PROJECT (ESP)

One of the main challenges of the IESO is to showcase the current state of 21st century science in general and earth science in particular. To address this challenge, the 7th IESO in India introduced a new activity called the "Earth System Project". This lays emphasis on the evaluation and development of the following scientific skills: data collection, data analysis, reasoning, system thinking, communication and collaboration and oral and written presentation.

Multinational groups of students research the topic using and analysing the data they collect from the internet. They would present their results and findings in the form of posters that will be viewed by all the IESO participants. A jury will evaluate and decide on the Gold / Silver / Bronze Research Project Teams. The rubric (evaluation scheme) for ESP follows:

Rubric for Evaluation of the Poster in the Earth System Project

Content

Categories	Complete										Partial										Very limited									
Depth of understanding of the Earth System phenomenon	10		9		8		7		6		5		4		3		2		1											
Complete connection of the earth systems	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1										
Use of geological principles	10		9		8		7		6		5		4		3		2		1											
Contextual use of scientific terms	10		9		8		7		6		5		4		3		2		1											
Originality and creativity	10		9		8		7		6		5		4		3		2		1											
	Did the poster included aspects which were not appeared commonly in the other posters?																													

Structure of the Purpose

Categories	Complete										Partial										Very limited									
Clarity of subject and purpose	10		9		8		7		6		5		4		3		2		1											
A clear connection among the poster's parts	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1										
	The ability to understand the monsoon phenomenon and the interrelationships among the earth systems that are related to this phenomenon just from reading the poster																													

The Quality of the Posters

Categories	Complete							Partial			Very limited
Visual display of the data	10	9	8	7	6	5	4	3	2	1	
	They used effective display of pictures, graphs, tables										
Minimal text and clear fonts	10	9	8	7	6	5	4	3	2	1	
Balance between graphics and text (One serving the other)	10	9	8	7	6	5	4	3	2	1	
The flow of the poster	10	9	8	7	6	5	4	3	2	1	
	Readers can follow the logic of the poster										
Aesthetics	10	9	8	7	6	5	4	3	2	1	

Oral Explanation

Category	Complete					Partial								Very limited						
Each of the team members can explain any part of the poster	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

International Co-operation

Criteria (cooperation and involvement)	Complete				Partial					Very limited
How many team members were actually involved in the project?	10	9	8	7	6	5	4	3	2	1
Quality of discussion amongst members	10	9	8	7	6	5	4	3	2	1
Were they open to learning from one other?	10	9	8	7	6	5	4	3	2	1
Did members respect others and give them an opportunity to contribute and speak up?	10	9	8	7	6	5	4	3	2	1

Statutes of the Internal Earth Science Olympiad

(Version 4, Published: November 1, 2016)

Preamble:

The IESO statutes were revised based on resolutions passed by the International Jury which met in Tsu, Japan in August, 2016. This version (Version-4), running to 11 pages, was published on November 1, 2016 and it supersedes all previously dated or published versions.

1. Introduction

The International Earth Science Olympiad (IESO) is an annual earth science competition for secondary school students. The IESO has been founded as one of the major activities of the International Geoscience Education Organization (IGEO), and countries worldwide with a strong emphasis on earth science in their national curricula have supported the competition. Students who are winners of the respective national competitions are invited to participate in the IESO, and all interested countries are encouraged to contribute to the IESO.

2. Aims of the IESO

The IESO is intended to:

- raise student interest in and public awareness of earth science,
- enhance earth science learning of school students,
- improve the teaching of earth science in schools,
- promote international cooperation in exchanging ideas and materials about earth science and earth science education, and
- encourage friendly relationships among young learners from different countries, and promote talented and gifted students in earth science.

3. Organization

The IESO is organized by an authorized institution(s) of one of the participating countries with cooperation of the IESO Coordinating Committee and the Examination Board. The competition is held every year in the territory of the organizing country. The official language of the IESO is English.

4. Obligations of the Organizer

The organizer of the IESO is obliged to invite all countries that wish to take part in the competition. The organizer must provide all participating countries with an itinerary of the IESO and supply a report of the competition held. The organizer may invite outstanding scientists and educators as observers and/or speakers by offering transportation and accident insurance for the invited person(s).

The organizer of the IESO agrees that there shall be no discrimination against countries and delegations on the basis of political orientation, diplomatic relationship, race, colour, gender, handicap, religious affiliation, or any other factors which are not pertinent to participation in the competition.

5. Delegations

Each participating country sends its own delegation. Each national delegation has a maximum of four participants and two mentors. In addition, a participating country may bring guest students and observers. Participants should not have been born before July 1, X-19, where X is the year of the Olympiad. The participants must not be university/college students. They can only be students of secondary/high school. If they have already graduated before the competition, the organizer must be informed about the date of their graduation. A student who has already participated in an IESO and who wants to participate in a subsequent IESO may do so only as a guest student and not as a member of a national team. This means that the student will not be eligible for any medals at the second or subsequent IESO.

The mentors should preferably be specialists in Earth science education or Earth scientists with some school teaching background. They should be able to discuss the questions/ tasks and how they can be improvised. They must know the official language of the IESO and thus be able to translate the question papers and related materials from English to the participants' native language. In addition, they should discuss the status of earth science education in their countries, what actions have been taken to promote earth science education, what could be achieved and what obstacles were faced.

6. Preparation of Items for IESO and Items of Co-operation

The organizer of the IESO is responsible for organizing all the logistics of IESO. The place and preliminary dates for the event should be presented by the organizer at least a year before the competition. The total duration of the IESO can range from one to two weeks. The event shall adopt the Earth System Science approach to impress upon the young minds that the Earth is but one large system. The event will consist of two parts: written (theory) and practical examinations. The written examination includes problems which are developed to measure the participants' robust knowledge and understanding in earth system science. The practical examination consists of tasks which are designed to assess participants' abilities to carry out scientific investigations in earth system science

inquiries. The written examination is presented in a set of earth science problems which should be solved by participants within a period no longer than six hours. Thepractical examination includes experimental and/or field task(s) which should be completed by participants during a suitable period.

The Scientific Committee of the host country and Mentors and Observers of different countries may send their questions and ideas to the Co-ordinator of the Examination Board. The Examination Board, while finalising the question papers, will ensure that the questions will be of good quality, of secondary/high school level, will test not the memory but the thinking ability and analytical skills of students, will conform to the Earth System Science approach, will correspond to the official IESO syllabus and will ensure a fair balance between written (theory) and practical tests. The Examination Board will also provide solutions and evaluation guidelines. Participants are given the theoretical problems and experimental or field tasks in a written format and supplied with materials needed to solve the problems and conduct the experiments. The participants are allowed to bring writing and drawing instruments and non-programmable calculators for the examinations. Written Test and Practical Test question papers of IESO (English and all non-English versions) constitute an important educational document. They will be published on the official website of IESO (www.ieso-info.org) so that all teachers and students of the world can access them. Hence, mentors have to give their acceptance, at the time of registration, for publication of the translated version, if any from that country, on the IESO website.

International Team Field Investigation (ITFI) and Earth System Project (ESP) are two activities aimed at promoting international co-operation and forging bridges of friendship among young, talented students across the world. Annexures 1 and 2 provide more details of ITFI and ESP. The assignments for ITFI and ESP would also be designed under the supervision of the Examination Board, which has to ensure the quality of the assignments.

7. The International Jury

The International Jury for the competition consists of a chairperson and members. The chairperson of the International Jury is appointed by the organizer of the IESO. The members of the International Jury are the two mentors in the delegations from each participating country. Resolutions of the International Jury are passed on the basis of majority votes in the presence of at least 75% of the members. Each participating country is entitled to one vote. The chairperson has the casting vote in case of a tie.

The International Jury has the following responsibilities:

1) To ensure that the competition is conducted in accordance with the regulations,

2) To monitor the examination process. The International Jury has the right to make decisions on excluding participants from the examination in case they do not comply with the regulations, including cheating,

3) To supervise the procedure of marking the participants' answers and ensure that all participants are judged by the same evaluation criteria,

4) To approve the final results of the evaluation, confirm the rankings, and decide on prizes for the participants. The chairperson and members of the International Jury must keep the results and decisions concerning the evaluation and prizes confidential until an official announcement is made, and

5) To moderate any difference in final scores among International Juries (recommended).

8.Evaluation and Prizes

The participants' answers to the written and practical examinations are evaluated and marked by the International Jury. The rankings of the participants are based on the total scores of the written and practical examinations. The official results of the evaluation and the number of medals to be awarded are decided finally by the International Jury. The number of gold medals is approximately 10% of the number of participants, 20% for silver medals, and 30% for bronze medals. An honourable mention may be made of a competitor(s) who does not win a medal but gains high marks for theoretical problems or one practical task. All medals and honourable mentions are awarded on an individual and/or team basis, not on the basis of national results. Each competitor receives a certificate in recognition of his/ her participation in the IESO.

Assignments for ITFI and ESP would also be evaluated by the International Jury. Members of the award-winning team/s in both ITFI and ESP would be given individual certificates. More details are given in Annexures 1 and 2.

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Each country participating in the IESO must pay for its participation. The quantum of the registration fee is determined by the organizer of the IESO and requested in an official letter to be sent to the participating countries. The registration fee can be reduced for developing countries if the budget permits. The fee should be paid prior to or at the beginning of the IESO. Each participating country must pay the travel expenses (to and from) of its delegation to the place in the country where the IESO is held. All other expenses directly related to the IESO, including the cost of accommodation, meals, and local transportation for all delegations from countries, are covered by the organizer of the IESO. The organiser of IESO shall waive the registration fee of the Chair and Members of the Examination Board.

10. Bodies of the IESO

The Examination Board is charged with the responsibility of receiving ideas and questions from the local Scientific Committee, and Mentors and Observers of different countries for the IESO examinations and finalising the question papers, besides providing the solutions and marking procedures as mentioned in paragraph 6 above. Besides, it also has to approve the ITFI and ESP assignments. The Advisory Board of the IESO advises the Coordinating Committee in maintaining high standards of the IESO. The Advisory Board is chaired by the chairperson of IGEO. The Advisory Board consists of International Council members of IGEO and representatives of related international organizations who are assigned by the chairperson as members of the Advisory Board. For the beginning period of the IESO, IESO Committee may function as the Advisory Board.

The Coordinating Committee attends to the long-term work involved in organizing the IESO. The members of the Coordinating Committee are the chairperson of IGEO and representatives of the countries which have hosted the IESO during the past two years and the countries which will host the IESO in the next two years. For the beginning period of the IESO, every participating country may have one member on the Coordinating Committee.

The Coordinating Committee elects its own chairperson and completes its work in collaboration with the chairperson and the organizer of the IESO in accordance with the aims and regulations of the IESO. The Coordinating Committee may establish several commissions, such as Public Relations, Fund Raising, Syllabus Development, and Operative Matters, to manage urgent problems or tasks of the Olympiad. A commission is composed of several members. At least one of them should be a member of the Coordinating Committee, and others are collaborators invited by the Coordinating Committee.

The International Jury is an ad hoc body formed for each competition. The International Jury consists of the chairperson and up to two representatives each from all national delegations. It is chaired by a distinguished specialist in earth science and/or earth science education who is appointed by the organizing country of the IESO.

11. Statutes

All countries participating in the IESO, their delegations, and the bodies of the IESO are obliged to observe the IESO statutes. Proposals for changes in the statutes have to be submitted four weeks before the first day of the IESO in written form by email to the local organiser of the IESO, who in turn would distribute them via email to past and present IESO participants and the IESO country representatives, before the specified deadline. Changes in the statutes can only be made by the International Jury when more than two thirds of votes with regard to the total number of the members are in favour of the suggested changes. Any matter not included in the statues is decided upon in the meeting of the International Jury.

Annexure-1
International team field investigation (ITFI)

The International Earth Science Olympiad is not just about competition among students. One of the principal objectives of IESO is to promote international co-operation and forge bridges of friendship among young, talented students across the world. To achieve this objective, IESO has as its integral part the International Team Field Investigation (ITFI) and Earth System Project (ESP). These activities are unique to IESO and set the latter apart from all other international science olympiads. The spirit behind the activities is not competition but co-operation, and coming together and working together of students from different nationalities, diverse cultures and varied backgrounds. This is singularly important today, and much more so in future, because major strides in scientific research are no longer possible by the efforts of individual scientists but of groups of scientists from different disciplines, institutions and nations.

Each group will be assigned a site to investigate. Students carry out investigations, learn through observations, collect data and take pictures in the field, search the Internet for relevant information, analyse all the data critically and answer the questions posed for each site. Further, they will prepare a report and make a PowerPoint presentation before all the students, mentors and observers. Thus, the audience will get to share the excitement about all the ITFI projects. A jury will evaluate the teams and decide on the recipients of GOLD/ SILVER/ BRONZE ITFI Teams. The rubric (evaluation scheme) for ITFI is given below:

Rubric for Evaluation of ITFI Project Presentation

Content

Components	Complete			Partial				Very limited		
The depth of the project:	10	9	8	7	6	5	4	3	2	1
	Was knowledge and information content beyond that provided by the field guide?									
Use of geological principles	10	9	8	7	6	5	4	3	2	1
Complete connection of the earth systems	10	9	8	7	6	5	4	3	2	1
Originality and creativity						5	4	3	2	1
	Presenting original ideas and perspectives which were not presented by the field leader.									

Structure of the Presentation

Tasks	Complete			Partial					Very limited	
Clarity of subject and purpose	10	9	8	7	6	5	4	3	2	1
A clear connection among presentations' parts (Flow of the presentation).	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

The use of Tools

Tasks	Complete							Partial			Very limited		
Concretization level of the subjects	10	9	8	7	6	5	4	3	2	1			
Minimal text and clear fonts	10	9	8	7	6	5	4	3	2	1			
Was the presentation dynamic to serve the content?	10	9	8	7	6	5	4	3	2	1			
Contextual use of scientific terms	10	9	8	7	6	5	4	3	2	1			
Aesthetics	10	9	8	7	6	5	4	3	2	1			

Oral Presentation

Tasks	Complete			Partial					Very limited	
Synchronization between oral and PPT presentations	10	9	8	7	6	5	4	3	2	1
Fluency	10	9	8	7	6	5	4	3	2	1
Time management	10	9	8	7	6	5	4	3	2	1

International Co-operation (To be evaluated on site by a Volunteer in cognito)

Criteria (co-operation and involvement)	Complete			Partial					Very limited
How many team members were actually involved in the investigation?	10	9	8	7	6	5	4	3	2	1
Quality of discussion amongst members	10	9	8	7	6	5	4	3	2	1
Were they open to learning from one another?	10	9	8	7	6	5	4	3	2	1
Did members respect others and give them an opportunity to contribute and speak up?	10	9	8	7	6	5	4	3	2	1

Annexure–2

Earth system project (ESP)

One of the main challenges of the IESO is to showcase the current state of 21st century science in general and earth science in particular. To address this challenge, the 7th IESO in India introduced a new activity called the "Earth System Project". This lays emphasis on the evaluation and development of the following scientific skills: data collection, data analysis, reasoning, system thinking, communication and collaboration and oral and written presentation.

Multinational groups of students research the topic using and analysing the data they collect from the internet. They would present their results and findings in the form of posters that will be viewed by all the IESO participants. A jury will evaluate and decide on the Gold/Silver/Bronze Research Project Teams. The rubric (evaluation scheme) for ESP follows:

Rubric for Evaluation of the Poster in the Earth System Project: *Content*

Categories	Complete	Partial	Very limited
Depth of understanding of the Earth System phenomenon	10 9 8 7 6 5 4 3 2 1		
Complete connection of the earth systems	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1		
Use of geological principles	10 9 8 7 6 5 4 3 2 1		
Contextual use of scientific terms	10 9 8 7 6 5 4 3 2 1		
Originality and creativity	10 9 8 7 6 5 4 3 2 1		
	Did the poster included aspects which were not appeared commonly in the other posters?		

Structure of the Purpose

Categories	Complete			Partial					Very limited	
Clarity of subject and purpose	10	9	8	7	6	5	4	3	2	1
A clear connection among the poster's parts	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	The ability to understand the phenomenon and the inter-relationships among the earth systems that are related to this phenomenon just from reading the poster.																			

The Quality of the Posters

Categories	Complete			Partial				Very limited		
Visual display of the data	10	9	8	7	6	5	4	3	2	1
	They used effective display of pictures, graphs, tables.									
Minimal text and clear fonts	10	9	8	7	6	5	4	3	2	1
Balance between graphics and text (One serving the other)	10	9	8	7	6	5	4	3	2	1
The flow of the poster	10	9	8	7	6	5	4	3	2	1
	Readers can follow the logic of the poster									
Aesthetics	10	9	8	7	6	5	4	3	2	1

Oral Explanation

Category	Complete					Partial								Very limited					
Each of the team members can explain any part of the poster	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

International Co-operation

Criteria (co-operation and involvement)	Complete			Partial					Very limited	
How many team members were actually involved in the project?	10	9	8	7	6	5	4	3	2	1
Quality of discussion amongst members	10	9	8	7	6	5	4	3	2	1
Were they open to learning from one other?	10	9	8	7	6	5	4	3	2	1
Did members respect others and give them an opportunity to contribute and speak up?	10	9	8	7	6	5	4	3	2	1

End of document

The International Earth Science Olympiad (IESO): Goals, objectives and syllabus

Commission members:
Nir Orion (Israel -Chair),
Afia Aktar (Bangladeshi),
Xavier Juan (Spain),
Moon-Won Lee (Korea),
Alan Munro (New Zealand),
Shankar (India),
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A. Introduction: goals and objectives

The Earth Sciences discipline has undergone a significant change since the mid-70's of the previous century. This change manifests itself in the shift from reductionism approach in which each domain of the Earth Sciences (Geology, Hydrology, Atmosphere) was considered an independent discipline to a holistic approach that emphasizes the connection among the Earth systems. During the 1980's these domains have been united into one discipline – the Earth Sciences. In the 1990's a new discipline evolved as part of the Earth Sciences, namely, Environmental Geology or Earth Systems.

This vast discipline has a variety of environmental aspects which are included in the Earth Sciences discipline. For example:

- The mutual influence between natural systems (Human involvement excluded) like the influence of chemical erosion of volcanic rocks on the carbon dioxide balance and as a result, changes in the climate.
- The influence of human intervention on nature, like changes in the composition of the atmosphere which cause air pollution, pollution of the water in the oceans and in fresh water sources. Overuse of natural resources, intervention in coastal processes, removal of waste and its influence on the environment, or the increasing of floods.
- The ability to forecast disastrous natural phenomena like floods, storms, earth quakes, volcanic eruptions, mud slides and avalanches.
- Using the physical environment to produce energy from sources like fossil fuels, organic materials and alternative energy sources like solar energy, wind energy, nuclear energy and chemical energy.
- Sustainable development of natural resources, using the water resources and preventing its contamination.
- Global changes in climate.

In recent years, the environmental concept of the Earth Science is found more frequently under the Earth Systems approach. This approach refers to

planet Earth as a whole where man is an integral part of Earth's natural systems, which are tightly combined and include the Geosphere, Hydrosphere, Atmosphere and Biosphere. This holistic approach, which based on combining in depth knowledge and comprehensive observations of all the components of the Earth can lead to a solution for the environmental problems our planet has to face.

During the 1990's there was a paradigmatic change in Science teaching in the Western world. This change can be seen in the shift from the paradigm that considered Science teaching to be a training tool for future scientists to the paradigm that considers Science teaching as a tool for the educating future citizens.

One of the existential challenges with which the citizens in the 21st century have to deal with is their ability to coexist peacefully with the environment. The teaching of Earth science and environment has a central role in teaching environmental literacy. The Earth Science endow the student, the future citizen, with knowledge and ability to draw conclusions about energy saving effective use of energy sources, saving water and proper use of Earth's resources.

Students, who understand their environment and its processes better, will be able to judge and evaluate the transformations and the changes that occur and as a result will behave in a better way. There is no doubt that combining issues such as energy sources, producing raw material and natural resources, forecasting and coping with earth quakes and volcanic eruptions, water sources and changes in climate in the syllabus is the appropriate response to the call from both the professional community and the public to the teaching of science in its social – environmental context.

The implementation of the Earth System approach means that the traditional emphasis of earth sciences teaching should change. It should move towards the development of an Environmental insight and not just granting Environmental awareness. The development of an Environmental insight entails the teaching of two key principals:

I. We live in a cyclic world made of a few sub-systems (Geosphere, Hydrosphere, Atmosphere and Biosphere) that coexist as a result of the material and energy that pass through them.
II. Humans are an integral part of the natural system and therefore should act according to the cyclic natural laws.

Operative Objectives

In order to achieve the goal of the acquisition of an Environmental Insight the new program posts the following objectives:

1. To acquire basic knowledge about the physical systems of Earth in composition, structure and the active processes inside them.
2. To recognize and understand the reciprocal relations of the transfer of energy and matter in and between the Earth systems including the Biosphere.
3. To understand the place of the human system as part of the Earth systems.
4. To acquire basic scientific research skills of making an observation and the ability to discern between an observation, a conclusion and an assumption.
5. To develop thinking aspects which are unique to Earth science: Thinking in a geological time dimension (Deep Time), spatial thinking and three-dimensional

thinking.
6. To develop the skills which are needed in order to develop an environmental insight: Cyclic thinking and System thinking.
7. To use Earth science as a tool to illustrate chemical, physical and biological principles.
8. To cultivate the connection with the natural scenery while understanding the uniqueness of Earth.
9. To understand the causes of natural hazards and their interrelationships with the human activity on earth.

In order to achieve these goals, the preparation of students towards the Earth sciences Olympiad should be based on the following principles:

Contents Principles for preparation students for the IESO

· There will be an emphasis to deal with Earth Science contents in a system context linked to the geo-biochemical cycles on Earth. For example, "The rock cycle in Earth's crust ", "The hydrospheric cycle" "The carbon cycle".
· The dealing with unique thinking skills concerning the Earth systems approach will be integrated with the contents and not separately.

Pedagogic Principles for preparation students for the IESO

· Active learning. The student will construct the knowledge and its understanding in a process known as inquiry-based learning. Consequently, the school laboratory and the outdoors will be central components in the learning process.
· The learning process will develop from the concrete to the abstract.
· The outdoors learning environment will be a mandatory component of the curriculum.
· It will deal with developing the following thinking skills where the Earth and Environment Sciences have a relative advantage:
- Taking observations and being able to discern between observation, assumption and conclusion.
- Three dimensional thinking skill.
- The development of the Deep Time dimension.
- Thinking simultaneously within the time and space dimensions.
- The development of cyclic thinking.
- The development of system thinking.

Skills and Abilities students should acquire towards the IESO

To be able to reconstruct in the field the sequence of geological processes that took place in the area being able to discern between an observation and a conclusion.
1. To be able to locate a geospheric phenomenon in the sequence of processes of the rock cycle.

2. To be able to do cyclical thinking in context of matter cycles in the Earth systems.
3. To be able to identify the components of a specific system (One of Earth's Systems) and to characterize each component in size, rate and complexity.
4. To be able to think systemically in order to understand the interaction between a specific system (One of Earth's Systems) and the development of interwoven interactions among the components of the system.
5. To be able to identify the interactions among the components of a specific system (One of Earth's Systems) as dynamic processes of the transition of matter and energy.
6. To be able to identify a specific system (One of Earth's Systems) as a cyclic – circular system in which the total amount of matter is conserved and the transition of matter does not occur on an equal rate.
7. To be able to identify dynamic processes in the time dimension while discerning among different time types, e.g., human time, historical or geological time.
8. To be able to identify environmental problems and to suggest solutions based on the understanding of the principles of the reciprocal relations among and inside the Earth systems.
9. To be able to think scientifically and make the distinction between an observation and an experiment, conclusion and hypothesis, the ability to hypothesize, draw conclusions and suggest solutions.
10. To be able to collect data from written and computerized sources, to process it with the appropriate software and to present it via graphs, charts, diagrams, drawings and concept maps.
11. To be able to represent and present knowledge in writing and orally using various means like research reports, a scientific poster and a computer presentation.
12. To be able to forecast and prevent the natural disasters such as earthquakes, volcanic activity, typhoon/hurricane, tsunami, landslides, and flooding"

B. The syllabus of the International Earth Science Olympiad

1. The Geosphere and Earth Systems

a) Key Ideas

1. Matter transition in and among Earth systems has to do with transitions between reservoirs (from one form to another). For example, the cyclic sequence – lithification, uplift, erosion, transformation, sedimentation, burial etc., creates a continuous "Rock Cycle" in which the total amount of matter remains constant, but its form changes when passing from one reservoir to another.
2. Earth's matter passes in a cyclic way between the different reservoirs while changing from one form to another. The matter passes in and between the different Earth systems: The rock system (rock and ground) – Lithosphere; The air system – Atmosphere; The water system – Hydrosphere; And the biological system – Biosphere.
3. The energy sources that activate the "Rock Cycle" are internal energy, conserved in the crust of Earth (radio-active disintegration), and external energy – solar energy.

4. There is reciprocity among the different Earth systems. For instance, erosion of rocks and the formation of soil are largely affected by the components of the Biosphere system like plants, fungi, worms and germs.
5. The formation of part of the residual rocks is tightly linked with biosphere processes. As a result, the sequence of rock layers has evidence to evolutionist processes (including mass extinction) that took place in the Biosphere, at the same time there were changes on Earth along the time line.
6. Changes in the crust of Earth whose source is internal energy, can be sharp and fast and occur on short notice (earth quakes and vulcanization) but can be very slow (the rising of mountain ridges). The changes in the Geo-sphere create a chain reaction in all the Earth systems, which may affect evolutionist processes in the Biosphere system.
7. The movement of plates expresses movement of matter and energy in Earth.
8. Earthquakes and volcanic eruptions, that take place mainly along plates' borders, are part of the mechanism of the transition of matter and energy on Earth. These geosphere phenomena have great influence on men and the rest of the biosphere system.

b) Skills and Abilities

1. The ability to identify the following igneous and metamorphic rocks: granite, ryolite, basalt, andesite, gabro, schist, gneiss, marble, quartzite.
2. The ability to identify the following igneous and metamorphic minerals: Quartz, orthoclase, plagioclase, biotite, muscovite, garnet.
3. The ability to identify rock structures such as porphyr, pegmatite, tuff, scoria, obsidian, lineation, and foliation.
4. The ability to identify in the field igneous bodies like a volcano, lava flow, dyke, sil.
5. The ability to understand the global meaning of local igneous and/or metamorphic phenomena in the context of the plate tectonic.
6. The ability to identify the following sedimentary rocks: limestone, chalk, chert, clay, marl, dolomite, sandstone, phosphorite, gypsum, salt.
7. The ability to define the following minerals: calcite, clay, halite, gypsum, pyrite.
8. The ability to identify the main composition of a soil.
9. The ability to identify in the field structures like layering, graded bedding, cross bedding, ripple marks, discontinuity planes.
10. The ability to identify in the field folding and faulting structures and to analyze the stress field that influenced the rocks (direction of pressing and stretching).
11. The ability to identify fossils and various forms of fossilization.
12. Making schematic cross sections along the Pacific, Atlantic and Indian Oceans.
14. Explaining the rock cycle in the plate tectonic terminology.
15. Making a schematic cross section through the earth (from the surface till the core)

2. Hydrosphere and Earth Systems

A. Main Ideas

1. There is a direct link between the geosphere and the hydrosphere systems.

The water composition and availability are direct products of the rock composition and the geological structure and many geological processes are conducting through the hydrosphere media.
2. The soil composition and the rate of the seeping of the water influence many factors in the Biosphere system starting with floods following by amounts and kinds of vegetation and all the way to the availability of water to all living creatures, humans included.
3. Atmospheric phenomena and processes have influence on water dispersal and the frequency of precipitation.
4. The amount of water available for human consumption is limited. Uncontrolled actions can cause an irreversible damage (In relation with biosphere time and the pace of the adaptation of the biological world to this change) to water resources and a drastic decrease in the amount of water available in a certain area in human life span.
5. The composition of oceans water and their physiographic structure are the immediate product of the reciprocity with the geospheric system.
6. It is acceptable to assume that Earth's original hydrosphere had fresh water exclusively. The evolution of the composition of oceanic water is the result of water's quality as a universal soluble and the quality of solubility of minerals.
7. Oceanic origin catastrophic events like tsunami and hurricanes are the results of interactions among the earth systems.

B. Skills and Abilities

1. The ability to identify and characterize the hydrosphere system as intertwined in the earth systems.
2. The ability to identify environmental problems and to suggest solutions based on the understanding of the hydrosphere system.
3. Understating the mutual connections among the oceans, the Lithosphere, the Hydrosphere, the Atmosphere and the Biosphere.
4. Understanding the mutual connections between man and ocean.
5. The ability of systemic thinking in regard with the oceanic system in context with all Earth systems.

3. Atmosphere and Earth Systems

A. Main Ideas

1. The radiation from the sun causes warming of all of Earth systems, but the rate of absorbing and radiation of heat in rocks (Geosphere), water (Hydrosphere) and air (Atmosphere) varies from one to the other. This phenomenon creates, at the end of a complex process, local and global flow systems in the Atmosphere (wind) and oceans.
2. The composition of the primary atmosphere of earth was mainly the result of gasses that were emitted by volcanoes. The evolution of the atmosphere is intertwined with the evolution of life on Earth.
3. For hundreds of millions of years the atmosphere keeps a more or less similar composition as a result of the mutual relations among the atmosphere with the

hydrosphere (oceans), biosphere (photosynthesis and breathing) and the geosphere (gas, volcanic dust and erosion).
4. In the short term human actions cause minimal imbalance in the atmosphere, but in the long term the oceans will become huge sinks that regulate part of the atmosphere composition. Since the biosphere is affected in the short term, even minute and temporary changes can cause terminal changes to part of the biosphere.

B. Skills and Abilities

1. The ability to distinguish between the components of a geochemical system, to identify mutual relations and to construct a network of interactions among them.
2. The ability to identify the interactions between the parts of the system as dynamic processes of matter and energy.
3. The ability to identify environmental problems and suggest solutions on the basis of understanding the principles of the geobiochemical system.

4. The Planetary System and Earth Systems

A. Main Ideas

1. The earth systems are a sub-system in the general planetary system – the solar system and it is impossible to get a full picture of the earth systems without understanding the processes of the passage of matter and energy between the solar system and planet earth.
2. Earth is one example in the solar system for the mutual relations that exist between the geosphere and atmosphere systems but there are more examples in other planets.
3. What we can see from here, we can't see from there and vice versa. The earth systems research allows better understanding of planetary systems in general, whereas research of other planetary systems helps to understand better the earth system.
4. The energy balance of a planet includes external energy – sun radiation, the influence of the sun gravitation and of close planetary bodies, and internal energy – as a result of the core activity, radioactive elements and internal processes.

B. Skills and Abilities

1. The ability to identify and characterize the planetary system as a system where the general amount of matter and energy is conserved.
2. The ability to compare data of the planets and draw conclusions about structure and composition.
3. The ability to identify the mutual connections among earth and the rest of the components of the solar system.

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